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NEWER CONCEPTS OF OTOGENIC MENINGITIS.*

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It is necessary to clarify some misunderstandings concerning old concepts before entering a discussion of recent developments in the diagnosis of meningitis. It has been customary to limit our view to the finding of a specific invading organism in the cerebrospinal fluid, to the clinical manifestations which the tissue reactions produce in the form of symptomatology and to autopsy findings; and in many instances our conceptions are built either upon one or other of these factors, rather than a summation of them all, with each being but one finding of a whole picture.

The desirability of very early diagnosis has often been stressed and yet the evolution of the meningeal lesion has not been accorded the significance that its gravity presents in the early stages of its development. The fact that the evolution of a meningeal lesion may be halted before data which is usually accepted as diagnostic has been overlooked in our summation of the clinical picture. The literature has stressed preformed channels from the middle and inner ear spaces and the profession has accepted these as the obvious tracts along which infection must travel on its way to the meninges; and cases are reported as otogenic without, in many instances, having estab-

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lished beyond any reasonable doubt that the endocranial lesion was spread along these routes. Many cases are recorded in the literature as otogenic without histopathological proof of the route of invasion. On the other hand, not enough stress has been placed upon the principles of retrograde thrombosis and metastatic foci along blood channels. These have almost escaped our serious consideration.

Nor have we studied the cases which have recovered from meningitis in sufficient detail and accorded them the notation which the valuable data they present merits. I know of no summation of those aspects of the clinical picture which progressively drop out as the case recovers. There has undoubtedly been a tendency to question the diagnosis in recovered cases. Nor have we accepted a diagnosis of meningitis unless there was undoubted evidence presented, that the spinal fluid contained bacteria. There is a school of thought that believes that the lesion is of a different nature if there is a differing bacterial content; and there have been schools of thought, that held that the finding of one class of cells as against another type of cell content in the fluid indicated a different meningeal lesion, all from the study of the cytology of the fluid. We were wont to consider the lesion as an inflammation of the meninges due to a bacterial invader, and we left out of account what happened to the brain substance itself and the role which this played in the evolution of the clinical picture. The cerebrospinal fluid has often been studied and it was held that in meningitis it was infected; but we failed to comprehend that much that was found in the fluid was really the washed off products of disease located in the brain tissue and in the blood channels.

Hence, the progress which has marked most other otologic research has been inadequate in this field of work. Very slight progress has been made and today meningitis is still the unsolved problem in our field of medicine.

Before advance can be made, it will be necessary to restate fundamentals, and upon these postulate a newer conception of the lesion; and with this in view I present the following for consideration:

1. A meningeal inflammation, including the inflammatory reactions of the brain tissue, is the result of bacterial invasion which most often reaches the affected parts by the route of the

blood stream, traveling either directly by way of the perivascular spaces or, because of a spread endocranially, by a regression thrombosis from the veins of the mastoid process, the petrosal pyramid or the perivascular channels of the labyrinth through venous structures traversing the mastoid tegmen, middle ear tegmen, endocranial roof of the petrosal pyramid, the structures of the mastoid process, petrosal pyramid and perivascular channels of the labyrinth being involved in an infective lesion beforehand.

In line with the view that the veins are the carriers of the infection toward the endocranium, Professor Oscar V. Batson of the University of Pennsylvania, is making a special study of these structures, and has sent me a specimen which I herewith present. He writes: —

"This is a temporal bone of a newborn child with one vertical cut going through the middle ear and the lateral semicircular canal. The internal jugular vein was injected with yellow. Yellow was used because of its greater brilliance in cleared specimens. As you will see, the bone surrounding the middle ear and the whole petrous portion contains veins which may be traced either to the sigmoid portion of the transverse sinus or to the petrosquamosal sinus which connects the middle meningeal veins with the sigmoid sinus. The petrosquamosal is fairly well developed in this specimen.

"If the idea of extension of an infection by venous channels, either with or against the flow, is at all competent, then we have here a perfect mechanism to explain the dural involvement in middle ear disease. Likewise, considering that these same venous sinuses also drain the brain, we might think of the arachnoid being involved by the same mechanism."

2. Preformed anatomical structures are also tracts used by an invasion to reach the meninges but, in each case, before such shall be accepted as the route involved, histopathological proof must be presented.

3. Meningitis is a generic term which has the sanction of usage. It is to be understood as describing a lesion which exhibits inflammatory reactions to bacterial invasion involving not only the meninges, but also the brain substance and the choroid plexus.

4. Cases of otogenic meningitis differ in patients of differing ages. A perusal of the literature shows that the lesion is more apt to resolve among younger than among older individuals. The literature gives a positive record of more recoveries among children than among adults, and in these children, very often the meningitis develops without the intervention of a purulent mastoiditis. In other words, it follows an otitic purulency. Nevertheless, in many instances mastoidectomies are undertaken. Here, too, the explanation is found in the veins of the middle ear.

5. Clinical evidence stresses the fact that the symptomatology is divisible into two groups of symptoms: those due to increased intracranial pressure and those due to toxicity, including the terminal sepsis from bacterial activity. Where the predominating symptoms are those of pressure, if this can be relieved, cure will not necessarily result until the other factors incidental to the lesion are mastered; but *time* is gained if one can relieve the pressure symptoms to carry on measures of combat against the other factors.

6. The establishment of surgical drainage *does not answer* the problem presented by meningitis because the lesion is a multiple one, consisting of many small foci of active infection spreading along the routes of many pial vessels. The problem is more concerned with keeping the brain tissue alive. To accomplish this, the results of brain tissue cell activity must be removed from the region about the brain cells; and the desired means of doing this is found in keeping the cerebrospinal fluid circulating. Any procedure which stops the circulation of the fluid defeats the objective which is in view. The brain cells naturally function best and their deleterious actions are removed best when they are kept surrounded by cerebrospinal fluid whose chemistry is maintained as nearly normal as possible. The stimulation for the removal of deleterious products of circulation is enhanced by the use of the Kubie method of forced drainage. In the early stages of the meningeal lesion, forced drainage is not needed. It becomes necessary after plastic exudates form. These should be prevented.

7. As we see meningitis clinically, it presents itself in stages. The diagnostic data will vary according to the stage at which we first recognize the disease. Each of these stages

is in itself somewhat of an entity which changes as the lesion evolves; and the clinical picture and the laboratory data vary as these changes occur. Those who would concern themselves with this lesion must learn to recognize the various stages, and be able to estimate a case and place it, in its proper clinical category, so as to effectively use therapy.

8. We should recognize that otogenic meningitis is as often a complication of acute purulent otitis media as it is the sequela of mastoiditis. We should try to differentiate those cases occurring during the course of an acute otitic infection from those following an acute mastoiditis. The time intervening between the mastoidal involvement and the first meningeal signs seems to have significance. The records show that the very poorest results from meningitis are found in those cases in which mastoidectomy was necessary during the first week of middle ear infection. Obviously, the stormy and alarming clinical picture makes necessary this early mastoidectomy; and the stormy clinical picture heralds the advent of the meningitis. The mastoidectomy *per se* seems not to inhibit the development of a meningeal lesion. Cases which occur as sequelae of middle ear chronicities are again to be comprehended as of a different origin and different nature. Often they are the result of secondary infections of cholesteatoma or the result from spreads endocranially or unrelieved, often unrecognized, labyrinthine, perilabyrinthine or petrosal pyramidal infections. It becomes necessary to differentiate primary meningeal invasions from those following infections secondary to otitic invasion.

9. Study of the healed cases from the literature shows that the cures seem to be obtained in cases where the clinical picture is not so stormy and the symptom complex can best be described as weak; and where pressure signs predominate over signs of toxicity. The Babinski is often absent or only very weakly present, and signs of pyramidal tract involvement are not distinctly marked. In addition, healed cases seem to occur among those who give a free, rather thin flow of cerebrospinal fluid, and the recovery cannot be predicated on a mild temperature curve.

The findings in the cerebrospinal fluid give the best indicator of the type of lesion present. The fluid shows the state of the brain tissue cells. It is the means of knowing and esti-

inating the amount of intracranial pressure; and through the study of its chemistry a knowledge is won of the tissue reactions.

Its physical characteristics are deceptive. Clear fluid often shows bacterial content and a markedly turbid fluid has been found to be bacteria-free. In view of the importance attached to the findings in the fluid, it is necessary to stress the fact that the fluid must be examined immediately after its withdrawal. It has been shown that fluid examined again and again after intervening hours will give differing findings.

This holds true no less for cytology than for the chemistry of the fluid. Regarding its antibacterial properties, these are well known inherent characteristics of the fluid, yet the absence of antibodies has been noted, and normal fluid, *per se*, when tested against bacteria, to estimate its inherent bactericidal properties, is found not to be highly antibacterial. The pathologic fluid differs somewhat from the normal in this respect. The factor concerned is still unknown. Only when the fluid is seemingly full of bacteria, when taken from a case that is well advanced, should it be chanced to delay examining it bacterially and making the necessary implants for cultures at once, after withdrawal. In all early cases it is extremely important to examine the fluid at once upon withdrawal, or its bacterial content will be missed.

Of course, the type of bacterial invader determines to a great extent the nature of the disease, although there will be found great similarity in the peculiarities of the anatomic lesion in the meninges, the brain, the vascular and perivascular tissues. Epidemic cerebrospinal, tuberculous, pneumococcal meningitides differ inherently because of the different pathogenic organism which is presented. On section and autopsy the findings are grossly similar.

According to most investigators, the cerebrospinal fluid is a dialysate, filtrating from the capillaries of the choroid plexus and from the capillaries of the perineural and perivascular spaces of the central nervous system. Eventually it reaches the venous blood channels, being absorbed into the lateral and longitudinal sinuses of the skull. Normally the fluid is in osmotic equilibrium with the blood plasma and its production and flow may be termed to be influenced toward an exaggerated production or a retardation by the relative dilution or

concentration of the blood, and this fact is utilized by Kubie, when he employs hypotonic solution to stimulate flow. Cerebrospinal fluid not only carries on the function of equalizing and maintaining intracranial pressure, but it also is concerned with the metabolism of the brain cells. Meningeal infection disturbs these functions. When the fluid cannot carry away the effects of metabolism, when a stasis in its circulation results, the cells are poisoned by the products of their own activity and there develops those clinical signs of toxicity and neural reactions which are noted in the clinical picture.

An index of this toxicity can be obtained by estimating the cholin content of the fluid. This finding has not much practical value at the present time, for there are other means of estimating the degree of toxicity present.

Ordinarily the fluid transudes through the capillaries of the choroid plexus in the face of intracranial pressure and this pressure also influences its absorption. The first effect of a bacterial invasion of the meninges is a great outpouring of fluid from the capillary vessels. I comprehend this as a defense mechanism—an effort on the part of the body to cleanse itself of the invading pathogenic bacteria and the resultant tissue reactions. Clinically, at this stage there is a demonstrable increase in intracranial spinal fluid pressure. At this time the interconnecting orifices between the various ventricles and the meshes of the pia are open because no real exudate has as yet formed and free fluid flow obtains.

The general effect of increased intracranial pressure is compression of the blood vessels, and this results in lessened oxygenation of the parts. Friedemann, in his recent lecture on the blood brain barriers in infectious diseases, says that in the pathogenesis of infectious diseases the brain itself is of outstanding importance and the oxygen consumption of the brain is very high. The effect of lack of oxygen to the parts by compression of the blood vessels cannot be over-estimated; and this lack of oxygenation plays its role in the formation of large quantities of lactic acid which are found in the fluid.

During fevers large amounts of lactic acid are also found in the blood plasma; and since in the early stages of meningitis, with which we are here dealing, there always is fever, it becomes necessary to estimate the amount of lactic acid present in the patient's blood, at the same time that the estimation is

made of the lactic acid content in the cerebrospinal fluid. Lactic acid has been found to be very much higher in the cerebrospinal fluid than in the blood plasma; and a ratio between the two findings can be established. The lactic acid content of the meningitic spinal fluid is apt to be four times that of the lactic acid content of the blood plasma.

There are several interesting and pertinent phenomena that result from the presence of this lactic acid in the fluid. These can be comprehended as reactions of the brain tissue cells and a further chemical inter-reaction in the chemical content of the spinal fluid.

In the second phase of the development of a meningitic lesion we must deal with intrinsic cell changes in the brain tissue, the cells of the choroid plexus, the perineural and perivascular spaces. Cell function becomes hindered and as a result the effects of cell metabolism are found in the fluid in the form of cholin in greater amounts than normally. I assume that the detail of the lesion, at the stage in question, is an edema of the structures concerned. My assumption is based on the known fact that the presence of the lactic acid in increased amounts must result in a changed iso-electric reaction of the spinal fluids and the cells bathed by it. Attention may here be called to the theory of Fisher, who places, in his studies of edema, its causative factor in the water-binding property of tissue colloids. When small amounts of acids are added to iso-electric gelatin, its swelling power is enhanced. Fisher contends that the cause of edema is to be found in the accumulation of acid products in the tissues. I realize that Fisher's theory has been critically questioned, and is held as not proven, but nevertheless, as far as the stage of meningitis is concerned with which I am dealing here, his theory seems to find a degree of substantiation. We have brain tissue colloids bathed in a fluid whose reactions are tending to swing toward the direction of "lessened alkalinity," and as a result we see edema and an interference with cell function.

The presence of the strong lactic acid results in a decrease in the alkaline reserve, or since in the modern nomenclature the actual expression of acidity is termed, in common usage, the minus logarithm of the actual concentration of the hydrogen ion which is present, we find a lowered pH. Our finding in meningitis fluids is 6.9 and 7.0 instead of the normal 7.5.

When it is remembered that a change of 1 in pH. is equivalent to ten times that amount in actual change in concentration of hydrogen ion, and that a lowering of the pH. of 0.5 in blood cannot sustain life, the actual significance and fundamental character of the lowering of the pH. of even 0.5 becomes apparent. The chemical phenomena of increased lactic acid in the spinal fluid has further consequences. The lactic acid being a strong acid drives off CO_2 from the carbonates, and hence in meningitis we should expect to find, and there is in fact found in addition to the very considerably lowered pH., a decreased bicarbonate content.

In previous papers I called attention to the copper reducing element present in normal spinal fluid and to the significance of its gradual disappearance from the fluid as the meningitis develops and bacteria become evident in the circulating fluid. Its reappearance in the examinations made later is of good prognostic significance.

From the entire examination of the fluid it is possible to establish diagnosis before the disease has seated itself so firmly that plastic exudate has formed and recovery is unlikely. Observations carried on over a long time have shown that with the first clinical signs of an otogenic meningitis a Kernig is observed. The gradual loss of the copper reducing substance always precedes its total disappearance and rarely do we find the presence of bacteria in either smear or culture before the copper reducing substance is gone. The lessening of the alkaline reserve in the tissues marks a change in the electrolyte pattern of the cerebrospinal fluid; and a change in the salt content disarranges the permeability of the perivascular tissues where the interchange from the blood to the spinal fluid is presumed to take place.

These dysfunctions are the factors which hinder metabolism and aid the development of the lesion. Added to this chemical dysfunction there ensues multiple minute thrombi of the pial vessels which give the septic casts to the temperature curve presented.

A note in regard to therapy: Enough has been done to permit a preliminary report. Where in an otogenic lesion meningeal involvement is surmised and from the chemical, cytological and bacterial studies a diagnosis of an early phase of meningitis is presented, the surgical removal of the entire

visceral side of the temporal bone is indicated as far as that is surgically possible.

This procedure consists in removing the tegmen mastoidea, tegmen antri, the bone over Trautman's triangle, over the lateral sinus and to the posterior edge of the mastoid process. In other words, expose all dura reachable in the middle cranial fossa and in the posterior cranial fossa without performing a radical mastoidectomy. Occasionally a radical mastoidectomy is necessary to obtain a wider exposure. This surgical procedure breaks the veins which traverse these structures to enter the dura. In this procedure Neuman, of Vienna, concurs and has also reported successful results. There are, in addition, authentic reports in the literature of the veins above referred to having been found thrombosed and carrying the infection intracranially from the mastoid process to the meninges. Finally, this procedure relieves intracranial pressure.

In addition to the above, I desire here to make a *preliminary report* on the use of *small blood transfusions* in these cases. For a long time I have used the blood transfusions and have clinically observed the good results without knowing why such results were obtained. We have undertaken a study to estimate the effect of the transfusion upon the chemistry of the cerebrospinal fluid and interesting phenomena were discovered. In this preliminary report I want to make record of it.

It was found that the transfusion seemed to bring the pH. toward the normal, increase the chlorides and the carbonates and markedly lessen the lactic acid content of the fluid. In other words, from the evidence at hand, meager though it be, there seems to be a trend toward the normal chemical content produced in the pathologic fluid by transfusion of whole blood.

I herewith present two charts of chemical studies before and after transfusion which were made by Dr. E. Fishberg, with whom I am collaborating in this work. There is still much to be done. I simply want to record the work in progress.

Clinical observation has shown that meningeal cases, where a free flow of fluid is obtained, give the best therapeutic results. Where the flow is hindered by exudates, mechanical obstructions in the communicating pathways between the ventricles, and where the fluid thickens due to concentration and large cell count, good therapeutic results are rarely obtained.

To enhance a freer flow of cerebrospinal fluid the Kubie method of forced drainage has shown advantages and has

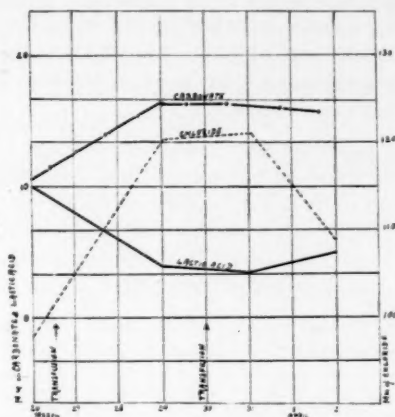


Chart I. Changes in chemical composition of spinal fluid after transfusion. Note change toward normal.

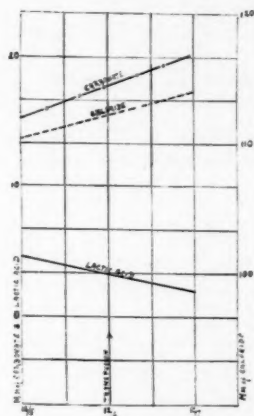


Chart II. Changes in chemical composition of spinal fluid after transfusion. Lactic acid lessened. Carbonates and chlorides rise in the fluid following whole blood transfusion.

given an added therapeutic agent to our forces, and I can bring testimony of the efficacy of the method to produce freer flow.

At this time, however, I cannot report a cured case wherein I have employed the forced drainage. The cases in which I have had success are those in which the diagnosis was made very early, long before the fluid thickened; and by removing the contributing causes and keeping the chemistry of the fluid as near normal as it was humanly possible to do so by repeated transfusions and repeated taps, the patient was able to handle the sepsis by his body forces.

It seems to me that the newer conception of meningitis tends more and more to get away from the delays in recognizing the lesion until it has become so firmly established that a reversal of its chemistry and an absorption of its lesions are impossible. The surgical break in the thrombosed communicating vessels is another added procedure which thus far has proven its worth.

51 West 73rd Street.

**REPORT OF ACUTE INFECTIONS OF MIDDLE EAR
AND MASTOID PROCESS AT MANHATTAN EYE,
EAR AND THROAT HOSPITAL DURING 1934;
THEIR PREVALENCE AND VIRULENCE.***

DR. JOHN RANDOLPH PAGE, New York.

The following is a report of the acute middle ear infections upon which myringotomies were performed at the Manhattan Eye, Ear and Throat Hospital during the last quarter of the year 1934 or, rather, from Sept. 15 to Dec. 6.

With the reports for the previous quarters already published, it completes the total for the year from Dec. 6, 1933, to Dec. 6, 1934, which is shown in another chart.

Eighty-seven cases were seen in the last quarter, and nine different types of infection are listed in their order of frequency. The five most prevalent were: *Streptococcus hemolyticus*, 28.7 per cent; *staphylococcus aureus*, 16 per cent; *pneumococcus*, Type III, 11.4 per cent; *streptococcus viridans*, 8 per cent; *staphylococcus albus*, 4.6 per cent.

Some idea of the comparative prevalence and virulence of the different organisms during the different seasons of the year may be gained from these records, and the variation in the nature of the infections from year to year if they are continued.

It is clearly seen that hemolytic streptococcus was the most prevalent offender at all seasons during 1934, and that it was responsible for more mastoidectomies than any other organism in the series that year. Less than half as many cases of *pneumococcus*, Type III, infections, however, were the cause of over half as many cases for mastoidectomy as hemolytic streptococcus. The proportion was 7.9 per cent for the latter and 11.1 per cent for *pneumococcus*, Type III.

*Read before the New York Academy of Medicine, Section of Otolaryngology, May 15, 1935.

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While 15 different types of infection were found among the 836 cases for the year, mastoidectomies became necessary in but four types. They occurred in the three most prevalent infections and in the fifth. Four mastoidectomies were performed in 185 cases from which no growth of bacteria was obtained.

In 252 cases of streptococcus hemolyticus infection 20 (7.9 per cent) mastoidectomies were performed; 184 were reported as cured after myringotomy alone, and 84 were lost sight of.

Out of the 117 cases of pneumococcus, Type III, infections 13 (11.1 per cent) had mastoidectomies; 75 recovered after myringotomy alone, and 29 were lost sight of. An equal number (117) of streptococcus aureus infections had five (4.2 per cent) mastoidectomies performed among them; 75 recovered after myringotomy alone, and 37 were lost sight of.

There were no mastoidectomies performed in the 52 hemolytic staphylococcus infections, and there was one among the 19 staphylococcus albus infections, the significance of which is doubtful in this single case. Nine recovered after myringotomy alone, and nine were lost sight of.

Myringotomies were performed on 836 cases during the year. It is difficult to explain, except as a result of faulty technique, the 185 cases from which no growth of bacteria was obtained and the four mastoidectomies in this group that had sterile cultures.

Forty-three, or 5.1 per cent, of the 836 cases required operation on the mastoid. Mastoidectomies occurred in but four of the 15 different infections, which indicates some prognostic value to cultures taken at myringotomy.

The most prevalent infection and the largest number of mastoidectomies were due to the same organism, hemolytic streptococcus. Pneumococcus, Type III, showed the highest proportion of mastoidectomies to the number of cases infected, and it, with the staphylococcus aureus, was next in prevalence, though less than half in number to the hemolytic streptococcus.

The average age of the patient (17 years), the average temperature (101.2°) and the average duration of the infec-

tion before myringotomy (seven days) were published in the report of the 300 cases seen in the first quarter of the year, also the number with discharging ears before myringotomy was performed. The latter furnished the fact worth repeating, that nearly three times as many mastoids were necessary among those whose drums ruptured spontaneously as among those who had a myringotomy before rupture occurred.

The largest number of cases (338) were seen between March 15 and June 15; the smallest number (87) in the last quarter of the year.

Forty-three mastoidectomies and one death occurred in the 640 cases that were under observation, and so far as is known in the whole series of 836 cases on which myringotomies were performed. The one death occurred in a case that had a sterile culture both at myringotomy and at the mastoidectomy, but pneumococcus, Type III, in pure culture was found in a brain abscess at autopsy.

TABLE I.

REPORT OF CULTURES TAKEN AT MYRINGOTOMY ON 300 CASES OF ACUTE MIDDLE EAR INFECTION.

Dec. 6, 1933 to March 15, 1934.

Average age, 17 years.	Average temperature, 101.2					Average duration of Infection, 7 days.				
Discharging ears (69 cases)						Non-discharging ears (231 cases)				
Types of Organism	No. of Cases	Per cent	Knife	Tube	Cured	Mastoid- ectomy	Knife	Tube	Cured	Mastoid- ectomy
Strep. hemolyt.....	92	30.6	31	19	11	5	61	42	31	4
Pneumo. III.....	51	17.0	12	7	5	2	39	26	24	4
Staph. aureus.....	38	12.7	6	3	5	---	32	16	15	---
Staph. hemolyt.....	16	5.3	7	3	3	---	9	4	6	---
Staph. albus.....	15	5.0	5	2	3	1	10	5	2	---
Staph. albus and aureus.....	8	3.0	2	2	---	---	6	2	4	---
Strep. viridans.....	4	1.5	1	---	1	---	3	2	2	---
Pneumo. IV.....	2	0.7	---	---	---	---	2	2	1	---
B. coli communis.....	2	0.7	---	---	---	---	2	2	---	---
*Friedlander's bacillus.....	2	0.7	---	---	---	---	2	2	2	---
Strep. hemolyt. and Staph. aureus.....	2	0.7	---	---	1	---	2	2	---	---
Hemolyt., staph. and B. coli.....	1	0.32	---	---	---	---	1	1	1	---
Strep. gamma.....	1	0.32	---	---	---	---	1	1	---	---
No growth.....	66	22.0	2	17	---	---	64	63	36	2
Not taken.....	---	---	---	16	---	---	---	61	---	---

TABLE II.
REPORT OF CULTURES TAKEN AT MYRINGOTOMY ON 338 CASES
OF ACUTE MIDDLE EAR INFECTION.
March 15 to June 15, 1934.

Types of Organism	No. of Cases	Per cent	Cured	Mastoid-ectomy
Hemolytic strep.....	112	33	69	8
Staph. aureus.....	47	13.3	31	3
Pneumo. III.....	44	13	30	4
Hemolytic staph.....	27	7.9	18	....
Staph. albus and aureus.....	25	7.6	21	....
Strep. viridans.....	6	2	4	....
Diphtheroid bacillus.....	4	1	3	....
B. coli.....	1	0.3	1	....
No growth.....	72	22	46	2

TABLE III.
REPORT OF CULTURES TAKEN AT MYRINGOTOMY ON 111 CASES
OF ACUTE MIDDLE EAR INFECTION.
June 15 to Sept. 15, 1934.

Types of Organism	No. of Cases	Per cent	Cured	Mastoid-ectomy	Deaths
Hemolyt. strep.....	24	21.6	15	2	....
Staph. aureus.....	18	16.2	11	1	....
Staph. albus and aureus.....	13	11.7	8	....	....
Pneumo. III.....	12	10.8	7	2	1
Hemolyt. staph.....	6	5.4	4	....	....
B. coli.....	5	4.5	4	....	....
B. diphtheroids.....	4	3.6	3	....	....
B. pyocyaneus.....	2	1.8	2	....	....
Strep. viridans.....	1	0.9	1	....	....
No growth.....	26	23.4	12	....	....

TABLE IV.
REPORT OF CULTURES TAKEN AT MYRINGOTOMY ON 87 CASES
OF ACUTE MIDDLE EAR INFECTION.
Sept. 15 to Dec. 6, 1934.

Types of Organism	Number	Per cent	Cured	Mastoid-ectomy
Strep. hemolyticus.....	24	28.7	22	1
Staph. aureus.....	14	16.0	13	1
Pneumococcus Type III.....	10	11.4	9	1
Strep. viridans.....	7	8.0	7	....
Staph. albus.....	4	4.6	4	....
Staph. hemolyticus.....	3	3.4	2	....
Staph. albus and aureus.....	2	2.2	2	....
Pneumococcus Type IV.....	1	1.1	1	....
B. coli communis.....	1	1.1	1	....
No growth.....	21	25.2	20	....

TABLE V.

REPORT OF CULTURES TAKEN AT MYRINGOTOMY ON 836 CASES
OF ACUTE MIDDLE EAR INFECTION.

Dec. 6, 1933 to Dec. 6, 1934.

Types of Organism	Number	Per cent	Cured	Mastoid- ectomy	Per cent Mast.
Strep. hemolyticus.....	252	30.1	148	20	7.9
Pneumococcus Type III.....	117	13.9	75	13	11.1
Staph. aureus.....	117	13.9	75	5	4.2
Staph. hemolyticus.....	52	6.2	33	....	....
Staph. albus.....	19	2.3	9	1	5.2
Staph. albus and aureus.....	48	5.7	35	....	....
Strep. viridans.....	18	2.1	15	....	....
Pneumococcus Type IV.....	3	0.3	2	....	....
B. coli communis.....	9	1.0	6	....	....
Friedlander's bacillus.....	2	0.2	2	....	....
Strep. hemolyticus and staph. aureus.....	2	0.2	1	....	....
Staph. hemolyticus and B. coli.....	1	0.1	1	....	....
Streptococcus gamma.....	1	0.1	....	....	....
Diphtheroid bacillus.....	8	0.9	6	....	....
Bacillus pyocyaneus.....	2	0.2	2	....	....
No growth.....	185	23.3	114	4	2.1

127 East 62nd Street.

INTRANASAL MALIGNANT GROWTHS.*

DR. WILLIAM HARTZ, Philadelphia.

Malignant neoplasms within the sinuses are uncommon. Recently I had occasion to observe and study some cases. On perusing the literature on this subject, I learned that but little had been written about it.

In eight years (1917-1924) G. B. New¹ collected 168 cases: 129 had primary origin in antrum; 39 were secondary to tumors of upper jaw. Treatment was given to 97 cases; 70 had primary tumors, and nine lost an eye on involved side. 27 had secondary tumors and two lost an eye. About 30 per cent were alive one year later; 23 per cent were alive three years later; 12.5 per cent were alive nine years later.

In 1927 F. O. Lewis² summarized 28 cases of carcinoma of antrum seen and treated at the Philadelphia General Hospital during the preceding five years: Eight cases were between 60 and 80 years; 11 cases were between 50 and 60 years; three cases were between 40 and 50 years; six cases were between 30 and 40 years. All except three cases proved hopeless. Sarcoma was not mentioned.

In 1930 Tribble³ reported that only six cases of antral malignancy were recognized among the thousands of cases examined over 13 years, part of this period being the world war days.

Sarcoma of the antrum is more common than carcinoma according to Stone.⁴ He also believes that malignant growths occur more often in the antrum than in the other sinuses combined.

In 12 years Davis⁵ collected 50 cases of carcinoma of the antrum and ethmoids. He states that 2 per cent of all malignant neoplasms are of intranasal origin.

Houser⁶ had a series of 21 cases: 19 carcinoma, two sarcoma (one child and one adult). More than 50 per cent were between 50 and 70 years of age. Metastasis spread to other

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sinuses and, in some, to the neck and chest. About 20 per cent, or four cases, were alive at the end of one and one-half years.

Fletcher⁷ believes that endothelioma arises in the intima of blood vessels, fills their lumen, and spreads into surrounding tissues. It grows slowly and metastasis is late.

Barnes⁸ comments on 17 cases of carcinoma. In six cases nasal polyps were removed over a period of years. In two cases the polypoid ethmoiditis masked an underlying carcinoma when first seen. He emphasizes that all tissues removed in ethmoid exenteration should be examined for malignancy.

Lacy⁹ also reports a case of nasal polyps masking an unsuspected underlying malignant growth. A radical antrum operation was done, with a cleaning of sphenoids and ethmoids one week later. This was followed by profuse bleeding and the laboratory report on the removed tissues was a low grade carcinoma of the mucous membranes, while the polypoid tissue was benign.

Opinions as to nasal polyps becoming malignant vary, but the mucous membrane beneath, may become irritated through frequent removal of polyps, and malignancy may result.

Symptoms: There is a similarity of onset³ of antral carcinoma and sarcoma. If it arises from the floor, we first get dental signs, such as neuralgia about the teeth. If it arises in the ethmoids or around the orbital plate we may see early swelling around the eye or a puffiness over the cheek, more persistent than in sinusitis.

There is no history of pain in early stages.⁴ Later, it is referred to teeth, due to irritation of Vth nerve. At times there is a tingling or itching over the cheek and a heavy feeling in the sinus itself. The dentist may be the first one to see these cases and teeth are extracted without relief. Meanwhile the growth enlarges and is recognized only when deformity and swelling appear, and then it is too late.

The growing tumor may be diagnosed as polyps or an infected antrum. Gradually there is a feeling of weight and further obstruction, and pain is felt, being referred to teeth, cheeks or eyes, depending on location of growth.

With further neoplastic growth, we get Eustachian obstruction,¹⁰ deafness, and pain, such as trigeminal neuralgia. A persistent otalgia, with negative ear findings and nasal hemorrhages are pathognomonic of early intranasal carcinoma. A little later there may be edema of soft palate, cheeks and nose.

On an average, symptoms were present three months or more before consultation⁵ and it was too late for curative therapy.

The symptoms at first are similar, namely nasal obstruction, bleeding and continuous mucoid secretion, with deafness and pain at times. We get epiphora if tumor is high and toothache if low. Free bleeding on probing should make one suspicious.

Trible's³ case had many teeth extracted, the bone was curetted but pain persisted. Biopsy showed malignant fungoid growth in antrum extending into nasopharynx.

As a rule the general health seems to be good in the early stages. Either the patient is seen too late, or the condition is not recognized until too late. So it behooves otologists and dentists to keep in mind malignancy and to try to make earlier diagnoses. All subjective and objective signs should be carefully weighed.

About 95 per cent of nasal polyps may be due to infection⁹ yet they may conceal an underlying neoplasm. Polyps are soft, pale and have poor blood supply. Malignant growths resemble polyps, but are more firm, pinkish and vascular and bleed easily on handling. This last sign should arouse suspicion.

A biopsy should be done of all tissues removed at operation and especially of that removed from the bases of attached polyps.

We should make freer use of other diagnostic aids, such as transillumination, X-ray, iodized oils or other opaque media, and antral puncture, with irrigation, and, when in doubt, do a biopsy.

Dr. New¹ suggests a quick report from frozen section, and, if malignant, to do immediate radiation or surgery.

When growth is visible in the naris, or nasopharynx, or causes facial deformity, its true nature is no longer in doubt. At times we also get a cervical adenitis.

Davis⁵ had a *lower group* of nine cases with origin in the alveolus of the molar teeth or hard palate, breaking through into the cheek and antrum, and later filling it with a soft vascular necrotic tumor. The *upper group* began higher up in the nose, and of these 15 sprang from floor of the orbit near the infraorbital canal, while 10 cases spread from the ethmoid region to the floor of the orbit. The origin of the other 16 cases was in doubt. In each case the growth filled the antrum and spread to ethmoids, anterior fossae of skull and other sinuses.

Adenocarcinoma began in infraorbital area. These tumors are of epithelial origin and grow rapidly. The upper group are seen in the nose and throat clinics and the lower group are met in dental and surgical clinics.

There were 27 males, and 23 females, in ages from 45 to 70 years. In the younger patients the growths were more malignant.

The cancer cells form a tumor, resulting in obstruction and pressure, persistent pain in cheek, temporal region or forehead.

If, after operation for chronic sinusitis, pain persists, make X-ray studies, and do likewise in cases with pain along the distribution of the Vth nerve.

Nasal examination reveals a polypoid vascular mass in the middle meatus, which bleeds freely on touching. As the tumor enlarges the eye bulges, the lacrymal duct is obstructed, and there is a terminal puffy swelling of the cheek below the infra-orbital margin.

Melanosarcoma is rare with primary origin in nose. Zahler¹¹ had a case with origin in the nose of a man, age 39 years. The growth was removed, but there was metastasis to the left tonsil and cervical lymph nodes six years later.

Another was recorded by Tweedie.¹² Nasal polyps were removed from a woman, age 75 years. Two years later a polypoid ulcerated growth was again removed and it proved malignant. Its origin was in the antrum, which the X-ray showed to be cloudy. She developed headache six weeks later.

One year later growth recurred, having spread to antrum and ethmoid region. She was treated with radium and died two years later from other causes.

Of this type eight others have been described where primary origin was in the nose, and they may be epitheliomas or sarcomas.

Malignant tumors may be: 1. Low grade or slow growing, as the mixed type. 2. High grade or rapid growing, as epitheliomas. Epitheliomas are irregular, and hard, have a dark purple or red color. Cervical glands may enlarge early in this type. Sarcomas may also occur early in life.

J. C. Beck¹³ calls attention to certain other growths. Precancerous: Benign at first, may become malignant later. Rhinophyma: Ingrowth of epithelium into hyperplastic glandular tissue of the skin of the nose. Paraffinoma: At first benign, later may become sarcoma. Cancroid: Epithelial cells invade the basement membrane. It grows slowly and 90 per cent are cured by radium.

Prognosis: With early diagnosis it is grave, later it is hopeless and death comes in a few months.

Treatment: Modern measures, such as electrothermic therapy; radium and X-ray give poor results¹³ and few cures in malignant growths in the nose and sinuses, because the bone becomes involved along with the vital structures nearby.

The earlier procedure was radical surgery followed by radium.

For the antrum the Mouré operation was advocated. It made an external, permanent opening into the antrum to facilitate application of radium. Later, the wound was closed by plastic surgery.

In 1926 Dr. New¹ used cautery in low grade tumors, using soldering irons, later replaced by diathermy. For high grade tumors radium was better and with this method 36 per cent were living two years later.

Rapidly growing sarcomas should have cautery at first, followed by radium.

Epitheliomas are best treated by radium. With diathermy, the tumor should be destroyed at one treatment.

Some still advocate radical surgery, with radium later.

Dr. Bloodgood advises against the use of a knife or a curette on a malignant growth, as it writes the death certificate and sends a call for the undertaker.

Beck¹³ also thinks cellular neoplasms, which are highly malignant, are most radiosensitive, and cellular sarcomas, small, round cell, and lymphotypes respond rapidly to irradiation. Fibrosarcomas and carcinomas, with fibrous infiltration, give poor response to large doses of radium and X-ray.

Surgery is better for more benign types of tumors. Others advocate use of radium before and after operation.

With surgical diathermy, first coagulate the periphery of the growth, then remove the tumor, or destroy with button or needle electrode, and curette away the slough. Use large amounts of radium later.

Teleoradium — known in Europe as teleo-Curie therapy, makes use of radium "bomb" or "cannon." Large amounts of radium, in lead containers, are used.

Massive doses of X-ray, up to 900,000 volts, are now used in Memorial Hospital, New York.

X-ray should be given to limit of skin tolerance, then do a Caldwell-Luc operation (make large alveolar opening) and clean out remaining tissues and insert radium.

Davis⁵ advocates surgery with complete removal of growth, followed by diathermy. His results with radium therapy and deep X-ray exposure are disappointing.

In inoperable cases, opiates, alcohol injections of Vth nerve, or Gasserian ganglion, are advised, or we may have to have a resection of posterior root.

REPORT OF CASES.

Case 1: Mr. T. C., white, salesman. When first seen on Aug. 23, 1934 he complained of nasal obstruction on left side. Father died of indefinite brain tumor. The present condition began 10 years ago, when he was treated for "catarrh" and obstruction. Nine months ago he was troubled with "sinus" disease, having an occasional purulent discharge from the left

nostril. Six weeks ago he had pain on the left side, radiating to left eye. There has been no bleeding at any time.

Examination revealed a large polypoid mass filling the left naris. It had a pinkish hue and was fairly firm. Nasopharynx and right naris were clear. On probing, the growth bled easily and for this reason I took a biopsy. The report was carcinoma of medium type from the Schneiderian membrane. Patient was referred for further treatment to X-ray department.

Sept. 7, 1934: X-ray of sinuses. Frontals: Clouding on left, with thickened mucous membrane. Ethmoids: Clouding on left with thickened mucous membrane. Maxillary: Diffuse clouding on left, extending to ethmoids. This has appearance of infiltrating malignant lesion with part of wall destroyed. Sphenoids: Clouding on left, may be due to extension or retained secretions, or to shadow of lesion itself.

Conclusion: Malignancy of left antrum with extension to ethmoids.

He was given a series of X-ray treatments and growth in the nose has sloughed away.

Sept. 22: Patient had severe bleeding, lasting 15 minutes, but there was no recurrence. Skin of face was irritated and inflamed.

Oct. 17: Skin is back to normal and ulceration in the mouth and palate has subsided.

Dec. 12: All inflammatory reaction has disappeared. Patient is now ready for a radical antrum operation, and for the application of large doses of radium through the alveolar opening.

X-ray of sinuses: Frontals: Right cloudy, with thickened mucous membrane. Left slightly thickened mucous membrane. Ethmoids: Left entirely obliterated, with no definite cellular outlines. Right clouded somewhat. Antrum: Left clouded, outlines seem destroyed, except at infraorbital margin. Right some membrane thickening. Sphenoids: Left is clouded. Right is clear.

Conclusion: Carcinoma of left antrum. The only improvement is aeration of left antrum. The wall of the left antrum seems destroyed since last X-ray report.

Jan. 17, 1935: I did a Caldwell-Luc operation under ether and found the mucous membrane thickened and shredded with irregular polypoid masses. The cavity was curetted and tissues were sent to laboratory.

In two days there was some puffiness over cheek and under the eye, but general condition was good and application of radium will be done shortly. Remained in hospital about three weeks, shortly thereafter four radium capsules, each 10 mg., were inserted into antrum through oral opening and allowed to remain for 96 hours or 4200 mg. hours. No severe reaction one week later. Patient now in good condition.

Case 2: G. R., colored, age 60 years, waiter. First seen Oct. 5, 1934, with complaint of dyspnea and dysphagia. The present condition dates from 1917, when a "stye" appeared on right eyelid. It was incised, but grew, and one year later it was again opened. In 1920 a "lump" on external canthus of right was treated with radium needles, and it disappeared. The growth reappeared, and on Nov. 21, 1927 a biopsy report was sarcoma of the orbit. Right eye was removed and orbit cleaned out along with part of floor of frontal sinus. He was seven weeks in the hospital.

He complained about tenderness in right antrum, with pain referred to top of head. Late in 1933 he noticed a swelling over the right cheek with obstruction of nose on same side. On Aug. 1, 1934 a section was removed at Hahnemann Hospital with report of carcinoma.

Sept. 25: He came to Dr. Butler's Clinic at the Graduate Hospital for this obstruction, and we learned he had a hemorrhage three weeks before. There was a large polypoid mass in right nostril, and it was also visible in the nasopharynx. It was friable and bled easily. At biopsy section proved to be carcinoma of right antrum.

Oct. 17: X-ray of sinuses: Frontals: Slight clouding, due to defective drainage. Ethmoids: Marked clouding on right, some of left. Maxillary: Complete obliteration due to density of growth extending to septum. The right side was dense and involved the infraorbital region. Sphenoids: Marked clouding on right due to defective drainage.

Conclusion: Extensive carcinoma of right antrum.

Oct. 18: Had a severe hemorrhage (1 pint). Nose was packed and he was admitted to the hospital. Later, he was given some X-ray treatments.

Oct. 26: Reaction in form of mucositis and skin irritation. Both nares totally obstructed by mucosanguineous discharge with polypoid mass, visible on right.

Oct. 31: X-ray shows no metastasis to lungs.

Nov. 14: 100 mg. radium filtered through 1 mm. of platinum was put in nose for five hours (500 mg. hours).

Dec. 12: Lesion smaller.

Dec. 19: 125 mg. radium for five hours.

Jan. 2, 1935: Condition poor. Seems weak and anemic.

Feb. 18: 100 mg. radium for seven and one-quarter hours. At present there is a thick mucopurulent secretion from an obstructed right naris. General condition of patient is good.

SUMMARY AND CONCLUSIONS.

Nasal and dental specialists should recognize the signs of early malignancy and institute prompt treatment.

Pain about the face warrants careful study, to eliminate malignant growths in sinuses. A persistent puffiness about the cheek is more characteristic of cancer than sinusitis. Cellular growths respond better to radiation. Benign growths do better with surgery. Any nasal growth, which bleeds easily on probing, should have malignancy eliminated. Polyps may mask a malignant growth, and sinuses should be opened for inspection and biopsy should be studied.¹⁴

Surgery about the sinuses for removal of malignant growths is not as effective as in other parts.

Proper dosages of radium and X-ray should be used in conjunction with surgery for exposure and drainage.

Some men recommend frozen sections at operation with immediate radiation, if malignant.

Beck believes that if biopsy is done with sharp blade, and very little trauma, there is no metastasis.

Dr. Bloodgood believes biopsy causes rapid metastasis. Always heed a blood-stained nasal discharge in an adult. Infection is more dangerous in this area on account of the anatomical relations. The younger the patient, the more malignant are the growths.

Davis⁵ advocates surgical exposure with excision of growth at first, followed by diathermy. Radium and X-ray proved disappointing.

Persistent swelling about the eye or cheek is more characteristic of malignancy than transitory sinusitis.

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400 South 15th Street.

OSTEOMA OF THE ETHMOID. REPORT OF A CASE.*

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A survey of the literature of the past 10 years disclosed reports of 14 cases of osteoma limited to the ethmoid labyrinth, these reports coming from Hungary, Germany, Italy, France, Belgium, England and America. Because of the infrequency of such cases, the following case was deemed worthy of reporting, particularly inasmuch as it presents several interesting points in the history and symptomatology.

Case Report: On Oct. 22, 1934, F. M., white, male, age 23 years, presented himself with swelling over the right eye and pain in, around and behind the eye.

Past History: The patient had an attack of a similar nature 12 months ago. At that time the swelling over the right eye was opened by a simple incision and drained for a number of days, after which it healed. Four months later, eight months ago, this same incision began to drain spontaneously, but several days later it again closed and the patient has had no symptoms from this area since. Ten months ago the patient was under the care of a neurologist and a neurosurgeon for the exclusion of a brain tumor, at which time his complaint was of severe headaches and visual disturbances. On that occasion, he was hospitalized for two weeks and encephalograms were made, but no Roentgenograms of the sinuses.

Present Illness: The orbital and periorbital pain began two days ago followed by the swelling.

Examination: There is a globular fluctuating swelling as large as a lemon extending from the right supraorbital region well beyond the midline to the left. *Nose:* There is mucopus on the floor of the nose on the right side, and examination

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with the nasopharyngoscope shows pus in the middle meatus and a small polyp issuing from the nasofrontal duct.

A tentative diagnosis was made of subperiosteal abscess with suppurative hyperplastic ethmoiditis and frontal sinusitis with closure of the nasofrontal duct, and with possible osteomyelitis of the frontal bone.

X-rays were made which showed dense clouding of the right ethmoid and frontal area, the antra and left ethmoid being clear. There was apparently an absence of the left frontal sinus.

Incision and drainage of the subperiosteal abscess combined with an external frontal and ethmoid operation were advised and were performed on Oct. 24, 1934, the delay of two days being occasioned by the insistence of the father of the patient.

Operation: Under general anesthesia, the usual external frontal incision was made. As soon as the soft tissues were incised, a large amount of thick, yellow, creamy pus exuded. There was a large subperiosteal abscess, extending from approximately the outer third of the orbital ridge on each side. As soon as the frontal sinus had been opened, about a half-ounce of the same type of thick, creamy pus exuded under pressure. The lining membrane of the frontal was markedly hyperplastic and polypoid in character. This was removed in its entirety. On the posterior table two small exposures, each about half the size of an appleseed, were found, with the pulsating brain visible below. These two openings were connected and enlarged so as to expose an area about the size of a quarter. The dura was found to be covered with clean granulations in this region. It was impossible to make a passageway between the frontal sinus and the nasal passage in the ordinary manner because of a large osteoma of the ethmoid, which was removed in its entirety after the medial and lateral nasal walls had been widely chiseled away. The osteoma appeared as a cast of the ethmoid, and when it was removed there was no ethmoid labyrinth remaining. Attached to the osteoma was a small polyp. Hyperplasia overlying the sphenoid was found. The orifice was enlarged and hyperplastic lining membrane removed. The anterior table of the frontal was very soft, the bone having the consistency of cheese. At the close of the operation, an incision about 2 cm. long was made 2 inches above the original incision so as to

give counter drainage to the subperiosteal abscess region. After the necrotic tissue within the cavity had been removed by curetting and excision, a strip of iodoform gauze packing was placed in this upper incision, another strip in the frontal sinus, two other strips in the sphenoid and ethmoid area, and one small folded strip against the exposed area of dura. The external frontal incision was left wide open. Wet dressings were applied.

A postoperative diagnosis was made of chronic frontal sinusitis and sphenoiditis on the right side, with a subperiosteal abscess, osteoma of the ethmoid, and beginning osteomyelitis of the frontal bone.



Fig. 1. Osteoma in actual size.

The patient's postoperative course was completely satisfactory and uneventful, and on Nov. 1, 1934, under general anesthesia, a secondary operation was performed, the following being the operative report at that time:

Under general anesthesia, the wound was cleansed. A small mushroom, self-retaining catheter with extra holes was placed in the nasofrontal duct, and, after removal of granulation tissue and the edge of the incision on each side, the two edges were approximated and sutured with black silk sutures and wet dressings applied.

Subsequently the treatment consisted of routine measures, the self-retaining catheter being removed on Nov. 20, which was sooner than would have been the case had the patient not

been complaining at that time of considerable pain and difficulty in sleeping. No pus was seen at that time and since then the patient's condition has continued to be completely satisfactory. He has been seen at regular intervals, and aside from one mild acute cold has had no difficulty, the nasofrontal duct on the right side remaining patent.

19 Garfield Place.

THE TREATMENT OF SINUSITIS BY THE DISPLACEMENT METHOD, USING EPHEDRIN AND BACTERIAL ANTIGENS.*†

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Los Angeles.

The sinus mucous membranes, as their name indicates, are moistened by a mucus-containing secretion. Under normal conditions a small quantity of limpid mucus is formed, but with the advent of inflammation a more viscid secretion, apparently created by mucoid degeneration of the ciliated columnar cells, appears. In the presence of much congestion and swelling of the mucous membrane the more viscid type of secretion which, properly speaking, is an exudate, moves slowly and not infrequently remains stagnant for a prolonged period of time.

Various symptoms naturally arise in this low grade catarrhal type of sinusitis. From the technical point of view, the usual methods of treatment have always presented vexing problems, especially when the ethmoidal labyrinth is involved. Surgical intervention is rarely indicated and irrigation of the ethmoidal cells by means of trocars and cannulas is practically impossible. The use of medicated sprays, douches, and nasal packs, on the other hand, actually fall far short of the mark, very little if any therapeutic solution entering the sinuses by these methods.

The application of the displacement method, devised by Proetz¹ in 1926, apparently merits greater consideration as a therapeutic procedure. By simply tilting the head and applying gentle suction at the nostrils therapeutic solution gravitates into the sinuses by displacement of the contained air.

This method, therefore, readily lends itself to the conservative treatment of the above mentioned type of chronic sinusitis.

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According to the recent experimental work of Walsh and Cannon,² local intranasal vaccination with bacterial antigens leads to the formation or concentration of specific antibodies within nasal mucous membranes. By mobilizing macrophages and concentrating antibodies the local immunity of the nasal tissues is augmented or at least their resistance to certain bacteria increases. In view of the widespread interest in the subject of local immunity, the application of bacterial antigens should be investigated and, if possible, a simple routine worked out for their clinical use. A wide variety of substances may be instilled into the nose and accessory sinuses by means of the displacement method, provided of course, that they are neither toxic nor irritating to the membranes.

The most effective class of drugs, according to Proetz,¹ for use by displacement are the astringents and vasoconstrictors, particularly ephedrin sulphate 0.5 per cent in physiological salt solution. In a series of 68 cases, treated by this method, Frazee³ recently noted that 63 per cent improved. On the other hand 45 cases were treated by Kracaw⁴ with autogenous endoantigens, prepared according to the method of Kreuger, and "marked improvement or cure" was reported in 66 per cent of the cases. In the following account, therefore, an effort has been made to compare the results obtained through the use of dilute isotonic ephedrin solution, stock bacterial antigens and autogenous antigens (vaccines) administered by the displacement method.

Technique of Administration: The nasal cavities are cleansed with capillary suction and sprayed with cocain or ephedrin. After a sufficient interval of time has elapsed to permit complete shrinkage, the patient is placed in a supine position with head completely inverted. This places the ethmoidal and sphenoidal sinuses in their most dependent position. The directions given by Proetz are as follows:

1. The patient's head is inverted so that the chin and external auditory meatii are in the same vertical plane.
2. Fluid is instilled into the nose.
3. Negative pressure (180 mm.) is applied intermittently to one nostril while a finger closes the other and the patient closes the pharynx by saying "K".
4. The patient is returned to the erect position.

The time required is approximately one minute. In actual practice, the simplest means of placing the patient's head in the proper position is to have him sit in a treatment chair with a pivoted back, which drops to the horizontal position. The head rest should be removed. The operator is seated behind the patient, so that when the patient is let down into the horizontal position, his head rests upon the operator's knees.

The patient is instructed to open his mouth wide and to continue to breathe through it. Many people close their pharynges automatically when they open their mouths; but in order to make sure that the nasopharynx is closed, it is advisable to tell the patient to say "K" while the suction is going on. The therapeutic solution is now instilled into each nostril by means of a syringe. The fluid should be at or near body temperature for comfort, not more than 2 cc. Intermittent negative pressure is then applied to one nostril through an olive tip, while a finger closes the other. This may be done by alternately inserting and withdrawing the olive tip from the nostril, but it is much better accomplished, with less discomfort to the patient, by opening and closing a hole drilled in the side of the tip for the purpose. The suction should be released as soon as the vacuum of 180 mm. is obtained, which occurs in a fraction of a second, and about one second should elapse before it is reapplied to permit the fluid ample time to penetrate the ostium.

After a dozen alternations, the first 2 cc. of fluid will have disappeared from the nasal chambers into the sinuses; two more are then instilled into each nostril, and the suction process is repeated.

A total of 8 cc. is sufficient for most purposes, but more or less may be required in individual cases.

OBSERVATIONS AND DISCUSSIONS.

Ephedrin: One hundred and fifty cases were treated twice each week with ephedrin 0.5 per cent in physiological salt solution. The results were evaluated at the end of two months. During this interval the solution was instilled from 15 to 20 times. Cases in which the outstanding symptoms (headache, postnasal discharge, and obstruction) were definitely relieved and the Schneiderian membrane returned to its normal form

and color were considered to be improved. Temporary and partial benefit was counted unimproved. By using ephedrin, in the above manner, 52 per cent of the cases were definitely improved.

Bacterial Antigen: Sixteen refractory cases which failed to show improvement after an adequate period of treatment with the above method (ephedrin in isotonic saline solution) were treated with a stock bacterial antigen (filtrate prepared from staphylococci, streptococci and *B. coli* according to the method of Besredka) in the hope of altering the local immunity of the sinus mucous membranes. Eleven of the 16 cases (70 per cent) improved after the addition of bacterial antigen to the ephedrin solution. From this it would appear that the supplemental use of bacterial antigen is better in some cases than ephedrin alone. With this in mind 135 additional cases were treated, using stock bacterial antigen and ephedrin from the beginning, and in this series 64 per cent improved.

In view of the above results it seemed advisable to try the autogenous type of therapy. Accordingly 11 cases were selected for bacterial culture and undenatured autogenous antigens were prepared according to the method mentioned by Kracaw.⁴ The results, however, were no better than with stock antigens, only six of the 11 cases were definitely improved.

Irritation: The instillation of bacterial filtrate (antigen) and of bacteriophage into the sinuses is quite irritating and not infrequently followed by severe reactions. For this reason it is best to begin with a dilute solution. In actual practice antigen is added to the isotonic ephedrin solution. Half strength antigen (50 per cent by volume) is presumably just as effective as undiluted antigen as far as topical immunizing action is concerned.

Influence on Pathology: There are several types of sinusitis and the futility of advocating any one method of therapy for the treatment of all types of disease becomes self-evident when one considers the diverse states and degrees of pathological involvement. In chronic sinusitis one frequently finds polypoid, cystic, and other deep seated degenerative processes within the mucous membranes (Semenov⁵). In such cases the application of the displacement method is practically useless.

Our results have been disappointing even when the treatment was carried on for a prolonged period of time, in several instances for as long as two years. The use of displacement is likewise contraindicated in acute and chronic suppurative sinusitis. In the acute nonsuppurative cases it is unnecessary, the symptoms can be treated with less trouble by simpler methods. Definite benefit, however, is derived from displacement irrigation during the subacute stage when there is an excessive amount of nasal congestion and mucoid or mucopurulent exudate within the ethmoidal labyrinth. Favorable results also appear in the low grade catarrhal type of chronic sinusitis in which there are no impediments to drainage, or in cases where such hindrances have been removed by previous surgical procedures, such as a submucous section of the septum, polypectomy, etc.

The action of ephedrin and dilute antigen within the sinuses is conducive to a restoration of normal tissue turgor and elimination of irritating secretions and exudates. Perpetuation of the circle of irritation, swelling, and retention is thus interrupted. The therapeutic action of the bacterial antigen is presumably due to local immunization, or at least an increase in the natural resistance of the mucous membranes brought about by the nonspecific action of foreign proteins. It is our impression that the immunologic process is largely nonspecific and the chief clinical value of this form of treatment may be derived from the inflammatory reaction which is produced locally, and to all intents and purposes, may be regarded in the same light as Bier's hyperemia and similar nonspecific methods of tissue stimulation.

Needless to add, a careful examination should be made and an accurate differential diagnosis of the precise location and pathological state of the involved sinuses is always necessary before rational treatment can be instituted and satisfactory results expected.

SUMMARY AND CONCLUSIONS.

The displacement method of sinus irrigation is more effective as a therapeutic procedure for ethmosphenoidal sinusitis than present methods of using sprays, douches and nasal packs. The beneficial results obtained with dilute ephedrin in physiological saline solution, as advocated by Proetz, can no

longer be considered open to doubt. The shrinkage action is smooth and protracted; and the total quantity of ephedrin which is given in the routine treatment seldom creates undesirable symptoms, as a matter of fact, few systemic effects have so far been observed except some slight beneficial action when the sinuses of asthmatic individuals are instilled with this solution. The best results are obtained in the subacute catarrhal type of sinusitis.

In the more or less chronic cases of simple uncomplicated sinusitis with frequent attacks of postnasal catarrh the addition of stock bacterial antigen (mixed streptococci, staphylococci and *B. coli*) to the ephedrin solution is worthy of clinical trial. A dilute solution (10 per cent antigen) can be introduced without discomfort to the patient. If progress justifies a continuation of the antigen the concentration may be increased until a 50 per cent solution is attained. In a series of 135 cases treated by this method definite improvement was noted in more than 64 per cent.

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THE VALUE OF X-RAY THERAPY IN CHRONIC SINUSITIS.*

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The X-ray treatment of sinusitis is comparatively new. The first therapy of this nature in chronic sinusitis was given by Dr. F. E. Butler and Dr. Ivan M. Woolley,¹ of Portland. To them belongs the credit of the development of this procedure. No references are available in the literature and no articles have been written on the subject except one pertaining to acute sinusitis by Dr. John D. Osmond².

At the time of writing of this paper I have had 72 cases treated by deep X-ray therapy. A complete record and follow-up has been kept of all such cases. Every type of sinusitis has been treated except atrophic rhinitis. It is now known that the X-ray therapy is of more benefit in certain types of cases, hence a larger percentage of cures and improvements may be shown in selected cases. It was my purpose to determine the value of this form of treatment in all types of cases. The cases were taken in order and not selected, so individuals were advised to have this treatment that had had many previous operations and various forms of treatments, as well as virgin cases. During and after the X-ray treatment no other form of treatment was given in 80 per cent of the cases, so the result would not be confusing.

RATIONALE OF X-RAY THERAPY.

X-ray has been demonstrated to be of value in various types of infections, such as boils, carbuncles and epidermophytosis. The X-ray is of value in reducing lymphoid hyperplasia, as in cervical adenitis, the enlarged spleen of leukemia and Hodgkin's Disease. In chronic sinusitis the picture is typically one of an infected mucous membrane with lymphoid hyperplasia and multiple infected glands. It is this selective action of the

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X-ray having a greater affinity for glandular tissue that makes the procedure a safe and logical one.

The action of X-ray on sinus mucosa is mainly one of death of the lymphatic cells followed by proliferation and migration in of histiocytes followed by fibrosis and sclerosis. Dr. Butler and Dr. Woolley conducted an experiment on cats by infecting the frontal sinus with virulent organisms on one side and treating them with X-ray in variable doses and at different intervals. Slides prepared from these and examined by Dr. Olaf Larsell showed the following features:

There was an early destruction of the lymphocytes in the infected mucosa. About 48 to 72 hours after treatment there is an increase in the macrophages, which are laden with cellular debris and bacteria. The membrane becomes reduced in thickness and after a week some fibrosis seems to develop. Several weeks later there is a return of lymphocyte formation in nodular areas. There is no evidence of injury to the cilia or epithelium except when twice the therapeutic dose is given.

CONSIDERATION OF OTHER STRUCTURES.

Much apprehension may be expressed concerning the olfactory nerve, the eyes, the hypophysis and the brain. On a clinical basis we have not seen any bad results occur to any of these structures. It is known that in chronic sinusitis the sense of smell is often diminished or lost. In five cases in this series they voluntarily stated that there was a decided improvement in the sense of smell. In one case where there was a perverted type of smell where food did not taste correctly the condition showed improvement within one week after treatment and now is almost normal. It is known that the nerve structures are highly resistant to deep X-ray therapy.

The eyes are covered in giving the treatment. It is not believed there can be any danger to the eyes due to scattered irradiations or the small per cent that may reach the optic nerve or the orbit.

The hypophysis might be considered a vulnerable area of tissue since it is the glandular type and is more susceptible to X-rays. About 90 per cent of the effectiveness of irradiation is expended in the tissues by the time it reaches the hypo-

physis. In order to get the maximum irradiations in the sphenoid the point of direction is slightly below, but almost directly toward the hypophysis. Epifaino and Cola³ have shown that from 90 per cent to 120 per cent of an erythema dose is necessary to destroy the hypophysis in rats and that 15 to 20 per cent of an erythema dose is stimulating to the hypophysis. There is an arrest in development in young animals with an atrophy of the bones and gonads when the destructive dose is given. There is an increase in growth and a hypertrophy of the sex glands when a stimulating dose is given. There is so much more tissue to penetrate in man than in mice, that it is highly improbable that over 5 or 10 per cent of an erythema dose reaches the hypophysis. Clinically there have not been any demonstrable evidences of either stimulation or atrophy of the hypophysis. It is my impression that it is not affected.

The brain evidently gets a very light irradiation, but not an injurious one. Probably less than 8 per cent of an erythema dose reaches the brain. Alpers and Pancoast⁴ studied 63 cases that were given deep X-ray therapy. They found no blood vessel changes of consequence and no changes in the normal brain tissue. They remark that the brain will withstand irradiation in large quantities. There was necrosis, patchy death of cells and increase in connective tissue stroma of the tumors treated. The dose given in treating these tumors was, of course, much greater than that given to the sinus cases in this series.

A few cases will be presented representing various types.

Case 15: E. L., age 20 years, student. Symptoms and history of repeated colds for the past five years, excessive nasal discharge, which was often purulent. Started to develop headaches six months ago which was not relieved by change of glasses. Deep X-ray therapy on May 7, 1934, as follows: 120 K.V.P., 11 in. distance, 4 mm. aluminum filter, 10 minutes per area, 5 M.A.

Complete relief of headaches within five days and marked decrease in nasal discharge to point of excessive dryness. Given potassium iodide saturated solution drops 10 three times a day for one week to increase secretions. Seen on Oct. 10, 1934. Nose appears normal and patient is subjectively normal. No other form of treatment given (see Figs. 1 and 2).

Case 15-A: C. M., age 35 years, logger. Symptoms and history of general body pains, rheumatism, weakness, nervousness and very heavy expectoration. Symptoms present for the past 10 years. Submucous resection in 1930 without relief. No headaches and no local tenderness. Deep X-ray therapy on April 8, 1934, as follows: 150 K.V.P., 50 in. distance, 3 mm. aluminum filter, 6 minutes per area, 25 M.A.

Had relief of general toxic malaise and relief, but not cure, of rheumatism. Gained 10 pounds of weight in two months. Relieved expectoration, but not completely. Observed Oct. 2. Still has mucopus in nose and very much hypertrophied tur-



Fig. 1. Case 15.

binates. There is less space in the nose than when seen three months ago and four months ago. Advised to have another deep therapy treatment.

Case 63: Sr. R. M., age 38 years, nurse. Symptoms and complaint of repeated colds and chronic cough. Otitis media in 1931 and 1933. Internist established diagnosis of sinus bronchitis or bronchiectasis. Patient was unaware of any symptoms referable to sinuses except that breathing space on right side was often defective. X-ray therapy on Aug. 16, 1934, as follows: 120 K.V.P., 10 in. distance, 4 mm. aluminum filter, 10 minutes per area, 5 M.A.

Followed by much edema and swelling of nose with development of headaches and profuse discharge lasting for three days. Cough very much improved and general malaise greatly relieved. Cyst in right antrum not completely obliterated by X-ray therapy so a Caldwell-Luc operation performed on Sept. 15. Recovery from operation very slow. Last observed on Oct. 10. There was complete absence of cough and beginning to gain weight (see Figs. 3 and 4).

Case 5: O. O., age 45 years, laborer. Symptoms and complaint of rheumatism for 15 years, had sinusitis last 10 years, has repeated colds, constant tired feeling, chronic cough, often



Fig. 2. Case 15.

has morning headaches. Had a submucous resection on March 25, 1934. X-ray therapy on April 4, as follows: 150 K.V.P., 25 M.A., 3 mm. aluminum filter for 6 minutes per area.

Followed by decrease in discharge for about four months and slight improvement in general condition. Developed influenza Aug. 10, with aggravation of sinusitis. Observed on Oct. 16. General condition and condition of sinuses seems to be very much like that of a year ago.

Case 38: E. M. I., age 45 years, store keeper. Symptoms and complaint of asthma for the past 10 years, much worse

the last year. Submucous resection in 1928. Left intranasal ethmoid in 1930. Bilateral intranasal antrum in 1932. Right intranasal ethmoid in 1933. Nasal discharge is minimal. Headaches are frequent. There is almost constant pain on pressure over right frontal area. X-ray therapy on June 26, 1934, as follows: 125 K.V.P., 5 M.A., 11 in. distance, 4 mm. aluminum filter for 10 minutes per area.

Pains in right frontal region increased for two or three days, then subsided completely and have been completely absent since then. Asthma was relieved greatly and patient was able to resume work within one week. Had a few minor



Fig. 3. Case 63.

asthmatic attacks in the last month but patient states that condition is 100 per cent improved. Objectively there is improvement in the nose, and the area of bony necrosis around the right frontal area has disappeared radiographically.

Case 46: C. F., age 35 years, salesman. Complaint and symptoms of repeated attacks of iritis in 1928 and again in 1934. Repeated colds and frequent headaches, very little nasal discharge and patient was unaware that he had sinusitis; however, he states that he has had chronic catarrh for several years. X-ray therapy on May 5, 1934, as follows: 150 K.V.P., 50 in. distance, 3 mm. aluminum filter for 6 minutes, 25 M.A.

Treated during acute attack of iritis with the eye involved uncovered. There was immediate and permanent improvement of the eye condition and patient states he is much less nervous than before; however, he does not notice any change in his nose because, as stated before, he was not aware he had sinusitis. Radiographically there is considerable improvement in the ethmoid. The antra were not badly involved.

Case 21: B. L. F., age 47 years, real estate dealer. Consulted me in 1931 because of excessive nasal discharge. He had an extremely heavy expectoration but was devoid of headaches and local pains. He had a general toxic malaise with



Fig. 4. Case 63.

weight loss. Had excessive expectoration for 10 to 15 years. Color of nose and turbinates indicates an allergic condition. Dean test shows 30 per cent nasal eosinophiles. Skin tests repeated negative. X-ray therapy on Oct. 20, 1932, as follows: 150 K.V.P., 25 M.A., 50 in. distance, 3 mm. aluminum filter.

No apparent benefit for one month and lost account of patient. Again seen two months later. Patient stated expectoration was practically negative and was gaining weight and felt much better. Has enjoyed good health (see Figs. 5 and 6).

Case 18: J. C. C., age 30 years, chemical laborer. Patient complained of severe frontal pains which were definitely local-

ized in the central frontal area, present for the past five years. Submucous resection in 1933 with no benefit. Has excessive expectoration, is very nervous, and is tired constantly. X-ray therapy on May 15, 1934, as follows: 150 K.V.P., 25 M.A., 50 in. distance, 3 mm. aluminum filter.

Not followed by any reaction. Patient began to feel better within one week, has gained in weight and has much less nasal discharge; however, he still has pains over the frontal area and occasional morning headaches. Radiographically there is marked improvement in the antra, the ethmoids are clearer but the central frontal cell has not shown many changes.

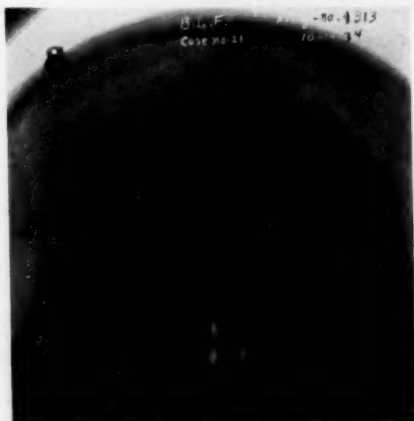


Fig. 5. Case 21.

OBSERVATIONS.

The Hyperplastic Type: X-ray therapy is of greatest benefit in the early uncomplicated unoperated case. This is best demonstrated in Case 15. Such virgin cases show a nice response. The dryness following X-ray therapy occurs in quite a few cases, in particular, if the turbinates are not well protected by shielding the nose. The case with the thickened membrane and the typical hyperplastic sinusitis shows the best result.

The Purulent Type: In Case 15-A we were dealing with a type with much purulent discharge for years with many focal

symptoms. There the results are not so spectacular. It is true there is considerable relief of the focal symptoms, but objectively there is still much remaining pathology. Such cases already have much scar and fibrosis from the prolonged inflammation. These are better for a while, then during a stage of lowered resistance reinfect themselves from a remaining focus. In such cases I believe repeated treatments would be correct. I have only used three treatments on one given case with some improvement each time. It is not advisable to give a full therapeutic dose sooner than two months.

Cases With Polyposis and Cysts: In such cases there is always general hyperplasia of some of the cells. In such there



Fig. 6. Case 21.

is shown marked improvement. The cysts, as in the right antrum of Case 63, may be diminished in size but not obliterated. Repeated treatments will not necessarily produce a healthy normal mucous membrane in such cases. Case 63 demonstrates the value of irradiation in chronic sinus bronchitis. It also demonstrates the fact that when the mucous membrane is later removed it is not completely fibrotic. This membrane dissected away from the bone as easily as any other, and sections revealed the ordinary picture of cystic degeneration. Many of the cases of polyposis show practically no benefit from irradiation, while some experience considerable relief.

I have seen the best results in cases with polyposis where the visible polypi have been removed and irradiation was given immediately afterward within three or four days.

X-ray Therapy Following a Submucous Resection: Case 15 demonstrates that it seems safe to give X-ray therapy immediately after a submucous resection. Some have expressed the belief that this might produce too much room in the nose resulting in an atrophic rhinitis. This has not been my experience in five cases in this series. Case 5 also demonstrates that too much must not be expected of the case of many years' standing; however, improvement in the general focal symptoms are certainly alleviated for a time. Here X-ray may be an adjunct if given in repeated doses every two months providing the general consideration of the patient's medical condition, such as the metabolism, the mineral balance, the vitamin intake, immunity to infections by vaccines and the nutrition are taken into account.

Asthma Due to Sinusitis: The inability to reach all of the mucous membranes and do a complete operation in patients having asthma, where due to chronic sinusitis, probably accounts for the small per cent of cures. Ferris Smith⁵ contends that if the operation is complete enough the result will be satisfactory. With the X-ray therapy we have the opportunity of reaching all the mucous membranes. Case 38 is highly satisfactory when compared to the average asthmatic patient. It is admitted that this case has not been followed long enough to be certain of the result. I consider the result may have even been better if he had not had the previous operations because, as stated before, cases who have had many operations show less response to X-ray therapy.

Iritis With Focal Symptoms in the Sinuses: Case 46 demonstrates the value of two things, namely, treating the sinuses as a focus of infection and having the eye uncovered and treating an iritis. I have used deep X-ray therapy on three cases of iritis and have seen nice responses in all cases. I would prefer to use a smaller dose than is employed to treat the sinuses.

Allergic Nasal Manifestations: In such conditions the response is highly favorable where there is mixed nasal infection. In many allergic cases the excessive swelling of the nose retains the secretions. This stasis favors the development of

infections. Case 21 undoubtedly has a minor degree of allergy in spite of negative skin tests. This is based on the Dean test, the history, the heavy nasal discharge and the appearance of the nose. I consider he had developed an allergic manifestation to the bacteria in his nose. Many of the allergic or suspected allergic cases have shown nice responses, the permanence of which can not yet be stated. Undoubtedly there may be a recurrence provided the allergen is not removed.

TECHNIQUE.

The treatments should be given by a competent Roentgenologist. The dose used by Butler and Woolley¹ was 120 K.V.P., 5 M.A., 10 in. distance with 4 mm. aluminum filter for 10 minutes per area, making about 900 small r. units. The dose used in this series has been variable, from 80 to 90 per cent of a skin erythema dose has been given. In some cases 150 K.V.P. has been given with 25 M.A., 3 mm. of aluminum filter for six minutes per area at 50 cm. distance. The principle involved is to get the rays into the tissue. The machines should be calibrated by an ionization process or the Victoreen instrument to know its individual output. A lead shield is made so the antra are covered and the rest of the face uncovered. A dosage, as above, is given through a correspondingly correct size port, directing the rays up and back toward the sphenoid sinus; next, the ethmoids are treated on one side, the eye being covered and the previously treated antrum and the frontal covered. Next, the frontal is treated, directing the rays down and back. In this manner the sphenoid receives a dose from each treatment. Care must be exercised that there is no overlapping of irradiation. The tip of the nose should be covered at all times to prevent excessive dryness. Patients are warned they may have the symptoms of an acute cold for a few hours or a few days. All do not experience this; however, a large mask may be used and the antra, frontals, and the ethmoids of both sides treated through a large port for five minutes, then five minutes per area may be given in cases of a pansinusitis.

SUMMARY.

A recent development for the treatment of chronic sinusitis in the form of deep X-ray therapy is presented. It has a definite place in a rhinologist's practice and can be used to advan-

tage. A greater per cent of good results can be shown if the cases are selected. The cases in this series were not selected and an attempt was made to run them as controls by not using other treatments as far as possible. The response is excellent in some cases, while others show practically no improvement. It is too early to report any as cures. In this series 25 per cent have shown marked improvement, 40 per cent have shown moderate improvement, 20 per cent have shown transitory moderate improvement, while 15 per cent have shown no improvement. The oldest cases are two years old. If one wishes to pick the case to give the greatest benefit it should be the hyperplastic type with or without moderately heavy expectoration, radiographically showing a thickened membrane and one that has not had prolonged advanced infection nor repeated operations. The allergic or borderline allergic cases show a nice response, particularly where combined with nasal infection as is often the case. The cases with cysts, polypi, those having had many radical operations or those having had prolonged suppuration do not show excellent responses; however, these are subjectively improved occasionally. Subjective improvement may be had without radiographic improvement. The histiologic basis of improvement is by destruction of lymphocytic cells in the mucosa followed by a migration and proliferation of histiocytes, a shrinking of the membrane and a fibrosis of infected glandular tissue. The value of the histiocytes in immune processes has been shown by Fenton and Larsell⁶.

There apparently is no danger to the eyes, the sense of smell, the hypophysis or the blood vessels. Benefit of focal symptoms, rheumatism, toxic malaise, sinus bronchitis, asthma, bronchiectasis, iritis, rhinorrhea, allergic rhinitis and headaches has been observed in this series where due to sinusitis treated by deep X-ray therapy. No experience has been had with atrophic rhinitis treated by small fractional doses as suggested by Butler and Woolley⁷.

CONCLUSIONS.

1. X-ray therapy is a valuable adjunct in the treatment of chronic sinusitis.
2. It is more effective in the hyperplastic type and allergic or borderline allergic cases with attendant nasal infection.

3. The chronic purulent types of many years and the type having had many operations show variable responses, most of which are not entirely favorable.

4. There is the occasional case in the last mentioned group which shows a spectacular result with subjective improvement and alleviation of focal symptoms. I am not able to predict when this will or will not occur.

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AN ABORTIVE AND CURATIVE TREATMENT FOR COMMON COLDS.

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Incidental to the nurse's work in my office practice, a procedure was carried out with those under treatment for digestive and other medical conditions who had contracted what is designated as a "common cold." This may be described as a coryza of quick onset, at first the presence of glairy mucus in the nostrils, a moderate to profuse discharge of thin mucus of an irritative nature, definite nasal obstruction, sneezing, coughing, a sense of illness accompanied with an impairment of appetite, on the third day mucopurulent discharge, at times evidence of throat congestion and inflammation, occasionally the sequel of bronchitis and paranasal sinusitis, the condition starting anywhere in the nasal cavities and the throat, and secondarily or primarily in the larynx and trachea.

This reports the results accomplished by the instillations to the nasal mucosa and nebulizations of the same solutions to the pulmonary stem mucosa of solutions of organic mercury compounds in which R_1 is the organic radical linked to the mercury and R_2 the organic radical containing an acid group capable of forming a water-soluble sodium salt; these compounds, being of low toxicity for animal tissues, show no tendency to precipitate blood serum and other proteins, and possess active bacteriocidal and virus destroying properties.

As to the cause or causes of common colds, there is diversity of opinion. A large amount of experimental and research work has and is being carried on concerning common colds both in this country and abroad. The literature is voluminous on the etiology and treatment of this condition, but practically nothing on the pathology. That which pertains to infection as its cause may be summed up briefly as follows: Webster and Hughes¹ from cultural studies of the nose and throat of 105 adults and children isolated pneumococci in 90 per cent of the instances. Webster and Clow² report that persons free from

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association of hemophilus influenza with pneumococci are in general free from coryza, sore throats, influenza and sinus disease and that chronic carriers of these organisms are especially susceptible to these upper respiratory conditions. Dochez, Shibley and Mills,³ in work on inoculating anthropoid apes report that coincident with the symptoms there was increase in pneumococci, streptococcus hemolyticus and Pfeiffer bacillus, but they believed these to be secondary invaders and that the condition was mostly due to an invisible and uncultural virus which in all likelihood belongs to the group of so-called submicroscopic viruses. Thompson and Thomson⁴ report that it is due to several species of organisms plus allergic and virus factors. Kneeland and Dawes⁵ report that either the hemophilus influenza or pneumococci may be the significant pathogen met with. Powell and Clowes⁶ in inoculations of prepared chick embryo and cultivation of the virus of common cold shows transmissibility up to 80 per cent, thereby confirming the report of Doches, *et al*, that fundamentally it is due to a virus. Yardumian and Lightner⁷ state that there was little difference in the bacteriology in those free from cold and those susceptible to them.

In the report of the Commission on Medical Education (1932) upper respiratory infections, not including tuberculosis, throat infections and sinus infections, but probably including pneumonia, represented 15.1 per cent of illness throughout the country. Since but few are exempt from attacks of colds, this is a great loss economically, not to mention lessening of the efficiency of the worker, the fears that accompany colds in many persons, the dangers of its communicability to others, the spreading of acute respiratory infections especially at epidemic periods and the danger of severe sequelae.

My first experience was a personal one with a persistent and severe postnasal cold in which the result from the use of one of these solutions was striking. This occasioned an examination of tissue removed by biopsy punch from the inferior turbinates of three individuals who had head colds representing two, four and eight days' duration. Study of the specimens showed a congested and thickened mucosa with a layer of mononuclear cell deposit and subepithelial edema, both apparently a secondary phenomena. Careful studies by different methods of bacterial and tissue staining failed to dis-

close bacteria in the substance of the tissue. These slides were of small bits of tissue and, therefore, unsatisfactory for study of inclusion bodies so commonly seen in virus producing diseases. None were seen, although this does not exclude virus as a cause. The suggestion was that whatever the infection, whether virus, bacterial or both, the infecting factor was operating on the surface of the mucosa only and the tissue was reacting in a protective way to overcome it and prevent invasion. While this was definite, it was not possible to prove that virus or toxic substances were not present in the tissue or that an allergic process to them existed. On the assumption that the pathology noted was of a protective nature, even if virus or toxic content were present in the tissue, the employment of what would be destructive to surface infection was suggested as a type of treatment to employ.

The relative toxicity of antiseptics on bacteria and tissues in cultures were investigated by Bushman and Bloom⁸ on the basis of the greatest dilution that killed *staphylococcus aureus* and the greatest concentration in which tissue cells show approximately normal growth. It was judged that products which met the ratio requirements of destruction of infection and safety to the tissues were the best types of antiseptics to employ, although it may be taken that the "ideal antiseptic" is yet to be advanced. Each of the three commercially known organic mercury compounds which are high in mercurial content have been tried out clinically and it may definitely be stated that each of them are efficient to quickly stop a cold in the upper and middle respiratory tract when applied topically and in the first 24 hours.

For the purpose of the first observation and study, 36 consecutive cases of colds in the head were used, each treated in like manner with the three different compounds, 12 with each of them. The treatments consisted simply of discharging half a dropper of the solutions with a quick squeeze of the bulk into the nostril on each side so that the solution floods the forepart of the inferior turbinates and runs to the throat, the individual breathing through the mouth and remaining supine until the fluid runs posteriorly into the throat when the upright position is assumed. Advice was given not to "blow the nose" for 15 minutes, and the patients were given a bottle of solution and dropper so they could treat themselves every three hours

until the cold was gone. Because of the mercurial content of the preparations a metal atomizer was not used and really is unnecessary. The observations were that usually within the first hour after the instillation in the average head cold, benefit was experienced, this being especially true if the cold was treated in the first day, which cases required but a few doses for complete cure. The record of these early observations are as follows:

	Mercurochrome 1:50	Metaphen 1:2500	Merthiolate 1:1000
Germicidal equivalent to phenol as stated	80	500	700
Mercurial content*.....	26.7%	56%	49%
Head symptoms present in hours	31	37	38
Average number of treatments to clear head condition.....	3.2	3.1	3.1
Chest invasion, cases.....	3	4	4
Those cleared, 3 days, cases.....	2	2	2
Those cleared, 4 days, cases.....	0	1	1
Those cleared, 5 days, cases.....	1	1	1
Local distress from injections†..	12	11	9
Staining of linen.....	marked	slight	none

*Note different strengths of the solutions employed. According to the mercurial content irreconcilable claims are made by the different manufacturers of these substances.

†This does not last more than 10 minutes, and in occurrence and intensity is dependent upon the degrees of congestion present.

Using mercurochrome, where because of its red color, the observation can easily be made, the solution remains in the nasal cavity for about two hours during the day and for some time longer if an instillation is made at bedtime. The benefits accomplished suggest that the mercury compound in the solutions in some way fastens to the mucosa and in some circulatory way distributes, or that in coryza there is a pivotal point of infection present which, when stopped by the solutions, the rest of the mucosal congestion quickly subsides.

The above observations were made during the last part of October and the month of November, when in New York City there was an epidemic of head colds of moderate intensity. Quite cold weather continued and beginning about the middle of December the number of cases quickly enhanced and were distinctly more pronounced in vigor of onset and intensity of the symptoms. While in the first group the instances of laryngeal and tracheal involvements were few and nonsignificant, they subsequently become more numerous and pronounced.

The observation then was that almost from the onset of the head cold, certainly within a few hours, a considerable number become hoarse and began coughing. Several cases started with chest symptoms at once, with practically no nasal or throat disturbance, although in all of these some congestion in the nasal tract existed. Those in whom the onset was nasal, or mostly so, cleared quickly on nasal instillations, the chest symptoms subsequently subsiding, but when the case presented a quick chest involvement, as if the head and the chest condition started together, or only the chest condition presented, the instillations to the nasal mucosa could not uniformly be depended upon for quick results. In these, the solutions were inhaled, using a "glaseptic" nebulizer (without the extension attachment) for the purpose, the treatments were taken at hourly intervals because of the small amount of solution that can be applied in this way, the three-hour nasal instillations being used at the same time. This combination was only slightly less efficient to abort the chest involved cases as those that were only nasal or mostly so.

At the time of this publication, 169 persons with "colds in the head" have been handled. Taken promptly at the onset of a cold (within 12 to 24 hours), commonly one to three instillations suffice to stop it. In cases where the head condition had been standing from one to several days usually more instillations are necessary. It appears that only a few instillations are all that are necessary to control the infection, but because of the depth and degrees of the reactive pathology in the cases of some days' duration, it takes time for the submucosal pathology to subside enough for definite improvement to be noted by the patient. Since this cannot be proven and the solutions are harmless to employ frequently, the instillations were carried on until the symptoms were definitely improved. It has been suggested that a further proof of the value of this method would come from contacting infective material with one of these solutions and using the chick embryo as Powell and Clowes had done. I feel, however, that from the striking clinical results accomplished that a mixture of the two as an inoculating material would give only negative results.

Recently these substances have been supplied in oils, the merthiolate and ephedrine combination being well known. In

my observations these have not been as effective as the aqueous solution, although through the interest and kindness of Dr. Diehl (Director of the Department of Preventive Medicine and Public Health, University of Minnesota), his results were practically the same with both methods. Using the aqueous preparation he reports on 56 patients: 46.4 per cent definite improvement; 37.5 per cent, questionable improvement; and 16.1 per cent, no improvement. In a group of 27 attempts with the use of the merthiolate and ephedrine oil mixture my results were about the same as Dr. Diehl reports, but strikingly better with the aqueous solution in the early cases. This brings up several questions not possible of being answered now. In 103 cases with the head symptoms existing not longer than 24 hours, definite improvement took place in 91 per cent—that is, the acute symptoms were eliminated in 24 hours' time and there were no "no improvement" instances. About half of these had done this more than once with themselves and with members of their families and friends. Record of these are not attainable, but these must have been at least 300 instances. When the coryza has existed for several days, the aqueous solutions did not stop more than one-half of the instances and the questionable results and failures were about in the same figures as with the oil solutions. It is probable that for geographic and biologic reasons infections differ in different epidemics and places giving varying results to any form of abortive and control methods in the handling of respiratory infections. Since, however, the efficacy of this treatment depends upon mercurial effect and an organic combination, it seems logical that these would work more effectively on the nasal mucosa when it was in an aqueous rather than an oily solution, especially on the mercury combining effect on the sodium salts on the surface and in the mucosal tissues. It is manifest that the release of the mercury radical R_1 for anti-septic action is dependent upon the acid radical R_2 combining with the water soluble sodium in the tissue and that this would be more prompt and efficient when acting in a water menstrum compared to oil. To each of the solutions about 2 per cent of glycerine and 3 min. of a 16 per cent alcoholic solution of thymol to the ounce are added.

In all of my cases no complications from the colds ensued in the paranasal sinuses or the lungs. Among them were 14 persons who gave the history of persistent sinus conditions

following colds in the past, some even claiming that a cold in the head always awakened this trouble. The suggestion here is that this way to control a sinus condition is to stop an infection at the start, before a deep pathological process in the mucosa takes place, and this may also be true with serious sequelae in the chest that ensue from colds. On the supposition that continued infection may be a factor, with whatever else in the way of other treatments are being carried out, it would be interesting to use instillations in the continued sinus cases daily over periods of time. Even in instances of "sinus individuals" where the symptoms of an acute flare-up are intense and had existed for a full day or more, the use of the instillations took all the acuity out of the condition and stopped the constitutional symptoms of fever, increased pulse and lassitude in a few hours' time.

Swabs from the nose in eight of the cases of the December group showed the presence of pneumococci, Pfeiffer bacillus, streptococci, micrococcus, catarrhalis and organisms considered nonimportant. No definite significance in bacterial infective ways was deductible. The suggestion was that in common colds a virus was in all probability the initiating factor which causes enhancement of the bacteria. This probably explains the instances whereby anticold vaccines and antigens give varying results, one time satisfactory, the next time fair, and the next unsatisfactory, depending upon the bacterial immunity capable of being established and maintained in the control of the bacterial factor. All the solutions, however, are apparently destructive to both a virus and bacterial factor and from clinical results achieved debate on the etiology is not important. The significant point is that in the vast majority the colds were promptly controlled however it is accomplished, and whether by effect of these mercury compounds on virus, bacteria, or both. Should it be agreed upon, and the weight of the evidence since Flexner's work on entrance into the body of the cause of infantile paralysis is by way of the nasal mucosa, and should these mercurial compounds prove definitely destructive to viruses, an interest would come for their use as a prophylaxis in that connection. The same significance holds in active treatment ways in the acute influenzal infections of the upper respiratory tract, as well as in those tubal conditions of the chest that are believed to be significantly streptococcal or pneumococcal in nature.

CONCLUSIONS.

In several hundred instances of acute cold in the head when treated in the first 24 hours of its onset, the method gave complete control in 91 per cent in 24 hours' time and no failures up to 72 hours' time in all those treated.

Where the cold when treated had been present over 24 hours, quick control was accomplished in about 50 per cent of the instances, moderate benefit in 40 per cent and failures in about 10 per cent. The results in these in varying percentages showed that the earlier during the coryza the treatments were employed, the better the results. When, because of cell infiltration and edema, mucosal thickening is present, surface infection is controlled but those of stenosis take a day or two to subside.

These results were accomplished without any other form of local treatment, internal medications or rest in bed, all of the individuals continuing at their usual activities.

Because of quick and sustained antiseptic effect on the mucosa, the aqueous solutions of organic mercury compounds are more efficacious than when used in oil solutions.

The method is a distinct improvement over the use of vaccines and antigens which are not effective to dependable degrees, one that should serve to control serious complications from head colds, would allay the fear complex many have of colds and should serve as an economic saving.

Since it is well known that common colds do not produce a lasting immunity, it seems reasonable to believe that no method to prevent colds from being contracted will be discovered, and that the best that can be accomplished is a method of their quick control or abortion which is especially worth while when this method is perfectly safe and may be employed as often as may be called for.

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784 Park Avenue.

CESSATION OF CONVULSIVE SEIZURES FOLLOWING
INJECTION OF ALCOHOL INTO SPHENO-
PALATINE GANGLIA. THREE CASES.

DR. WILLIAM SPARER, New York.

There has come under my care three cases of recurrent convulsive attacks associated with nasal pathology. In each case the attacks were controlled by the removal of the irritative factors in the nose, or by intercepting irritative afferent impulses, through the injection of alcohol into the sphenopalatine ganglia. The convulsive spasms, which were considered originally as epileptic, were in reality recurrent nervous orgasms initiated by irritation of the cranial autonomies.

The etiological factors at work in any given case of recurrent convulsive spasms are usually of the same nature, and may be a direct nervous reflex or a chemical irritation of a nerve focus by toxins in the circulation. In the reflex type, where the afferent stimuli may arise from an impacted turbinate or tooth, or from pressure of a dry crust on the wall of a sinus cavity, the cause is a tangible entity, which can be readily dealt with. In the toxic type the causative factor may be a metabolic disturbance which produces a substance capable of sensitizing certain cranial nerve ganglia on an allergic basis and precipitating an orgasm when the concentration in the circulation becomes sufficient.

Irritation of the cranial autonomies may induce a vasomotor spasm along its distribution.¹ The cranial ganglia and nerve plexuses are all interconnected with each other and with the rest of the autonomic system, hence irritation of any portion may produce an effect locally, remotely or diffusely. The sphenopalatine ganglion is the largest of the cranial autonomic ganglia and is the only part of this system which is easily accessible. It is possible to greatly influence the distribution of irritative nerve discharges at this site, as injection of the ganglion with alcohol causes a destruction of nerve cells and fibres traversing the ganglion. A break in the arc

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will prevent accumulated nerve energy from producing a vasomotor spasm and initiating a convulsion.

The autonomic ganglia presumably do not include afferent or sensory ganglion cells.² The cells in the cranial as well as the sympathetic trunks are essentially efferent. The cells of the sphenopalatine ganglia are mainly multipolar and efferent. The lateral and nasopalatine nerves which carry fibres from the sphenopalatine ganglia are in part parasympathetic fibres arising in the sphenopalatine ganglia, and in part sympathetic fibres which traverse it, and myelinated fibres which are mainly afferent components of the Vth and VIIth nerves which traverse the ganglion. The nasal nerves from the sphenopalatine ganglia and the nasociliary nerves also include some afferent components of the vagus and upper thoracic spinal nerves.

From a consideration of the above it is evident that the injection of alcohol into this ganglion will not only disrupt synaptic contacts within the ganglion, but also will intercept irritating afferent impulses along certain fibres from the Vth, VIIth and vagus nerves. The interception of efferent stimuli will prevent vasomotor spasm.

Case 1: M. C., school girl, age 15 years. Since she was age 7 years she has had attacks of convulsive seizures of varying intensity, at times severe, lasting about 20 minutes according to her nurse. There was complete amnesia of all attacks. Intervals between attacks were seven to 12 days before she was put on luminal, and then three to six weeks.

Family History: No similar condition traceable.

Previous History: Pneumonia at the age of 7 years, two months prior to first attack. Measles at 3 years, and scarlet fever at 4 years. Menses began at 12 years, normal and not associated in any way with the attacks.

Surgical: Tonsillectomy at 10 years.

Physical: Young well developed female; height, 5 ft., 5 in.; weight, 102 lbs. Head: Normal in shape and measurements. Eyes: Normal vision in both. Ears: Normal. Nose: Radiograph reveals no abnormality in any of the sinuses. Septum is deviated to the right. Bilateral enlargement of middle turbinates.

Examination revealed a high deviation of the septum to the right, with bilateral impaction of the middle turbinates. Operation was advised, but postponed, and has not as yet been done. The rest of the physical examination was negative. Neurologic examination revealed no abnormality. Bowels: Was constive, but has been corrected by periodic colonic irrigation and dietary regulation. Blood examination showed a hemoglobin of 65 per cent and has been increased to 85 by hematonics and diet. Wassermann and Kahn: Both negative. Urine normal except for a 2+ indican reaction.

This case first came under my care on Jan. 7, 1934. The right and left sphenopalatine ganglia were injected, respectively, on Jan. 10 and Jan. 17, with a mixture of alcohol and novocaine. She had been on luminal medication for about five years. The dosage was gradually decreased and discontinued on March 1, 1934. There has been no attack since she was injected.

Case 2: J. F., salesman, age 45 years, weight 195 lbs. Has been subject to attacks of convulsive seizures associated with loss of consciousness, frothing at the mouth, biting of the tongue at times, with complete amnesia of the attack. First attack occurred on March 20, 1920. The attacks varied as to severity, duration and interval, which was from three weeks to three months. At times he would complain of transitory amnesia with no convulsion.

Family History: No history of any similar condition in the immediate or remote family.

Previous History: Has had no serious illness. Septum and ethmoids removed in 1927. Tonsils removed in 1926. Has taken luminal gr. 2 daily for five years.

Physical: Adult male, 6 ft. tall; weight, 185 lbs. Complete examination, including neurological, normal except for bradycardia. Laboratory: Wassermann and Kahn negative. Sugar tolerance normal. Urine negative. X-ray of head and sinuses reveal no abnormality. Electrocardiogram: Normal sinus rhythm, rate 60. No abnormality of curves in any leads.

The sphenopalatine ganglia were injected with alcohol and novocaine on Aug. 25, 1933, and on Sept. 5. The right side of the face became swollen over the region of the antrum, 24

hours after injection, but subsided with cold wet dressings. There has been no recurrence of attacks to date.

Case 3: F. W., female, age 23 years. Apparently normal until a year ago. Early in 1934 she began a series of attacks of amnesia which would last from a moment to 15 minutes. There was a definite aura, in the form of a sickening sensation in the pit of the stomach. The intervals varied from a few hours to several weeks. Two weeks before examination she experienced her first convulsive seizure, which was associated with complete amnesia, and during which she bit her tongue.

Examination was entirely negative except for the following: 1. Diseased hypertrophied tonsils. 2. Deviation of nasal septum with marked impaction of both middle turbinates. 3. Bilateral right angle impaction of completely imbedded lower wisdom teeth.

Tonsils were removed on Feb. 1, 1935. The sphenopalatine ganglia were injected with alcohol and novocaine on Feb. 4 and Feb. 8. There was quite a severe reaction to the first injection, the right side of the face became swollen to the extent that the right eye was completely shut for three days. The swelling disappeared with the application of cold wet dressings, and there was no further complication.

Submucous resection and removal of both middle turbinates was done on Feb. 25, 1935, and both impacted molars were removed on March 13. After removal of her three irritative factors and the injection of the sphenopalatine ganglia with alcohol and novocaine, her attacks have not recurred.

In each of these three cases, whether the convulsive seizures were initiated on a reflex basis from some tangible organic pathological condition, or from some endotoxin which may be a toxic metabolite with special affinities for certain nerve ganglia — perhaps on an allergic basis, it seems that the seizures can be controlled by a destruction of the synaptic contacts in the only accessible site of the autonomic system — the sphenopalatine ganglia.

In the first case we have to consider the irritation from the impacted turbinates, the anemia and the toxemia from constipation as factors in the etiology. Correction of the secondary factors and injection of the sphenopalatine ganglia prevented

recurrence of attacks in spite of the fact that the irritation from the impacted turbinates is still present. The second case may be classed as idiopathic but it is more acceptable to regard the initiating factor as a metabolic toxemia which periodically upsets the balance maintained by the sympatoparasympathetic nervous mechanism, precipitating a vasomotor spasm which may manifest itself by symptoms locally, remotely or diffusely. The third case is of the purely reflex type.

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50 East 10th Street.

RHABDOMYOMA OF THE VOCAL CORD—REPORT OF A CASE.

DR. JOHN D. KERNAN and DR. ARTHUR J. CRACOVANER,
New York.

There are few cases of rhabdomyoma of the vocal cord reported, a fact which warrants a report of this additional case. In an article entitled, "Myoblastoma of the Striated Muscle," in 1934, Dr. Paul Klemperer mentioned four cases. Dr. Charles J. Imperatori reported a case in *Transactions of the American Laryngological Association* in 1933.

Case Report: L. P., female, white, age 21 years. Admitted to Presbyterian Hospital Aug. 1, 1934, with a complaint of hoarseness for three months.

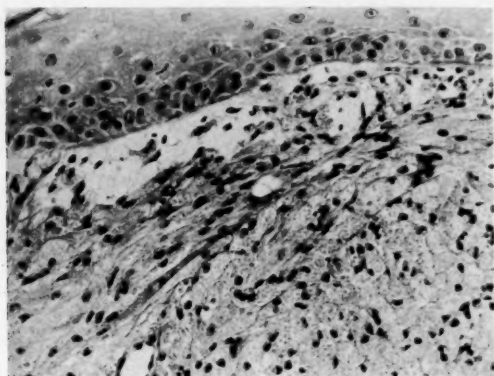
On indirect laryngoscopic examination a tumor of the left vocal cord was seen and was diagnosed as a papilloma. On direct laryngoscopic examination the posterior two-thirds of the left vocal cord was replaced by a friable rough tumor mass, which bled easily when touched. This mass was apparently confined entirely to the cord as no tumor could be seen above or below the cord.

Because of the possibility of malignancy, a biopsy was first taken. This biopsy was reported as follows:

Microscopic: The section shows stratified squamous epithelium which dips down in irregular strands into the underlying tissue. There are also apparently detached masses of epithelial cells beneath the epithelium. These epithelial cells are often irregular in shape, but show well developed intercellular bridges both within and between the cells. Beneath the epithelium the tissue consists of large polygonal cells closely packed together without any particular arrangement. All the papillae are filled with these cells. These cells have granular cytoplasm and small, round nuclei. The cytoplasm stains purple with the trichrome stain. No muscle fibres are seen in the sections.

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This is the characteristic picture of the so-called myoblastoma of striated muscle, with the accompanying proliferation of the overlying epithelium. This tumor is, of course, perfectly benign.



Diagnosis: Granular cell rhabdomyoma of vocal cord.
Dr. C. Haegensen.

A week later, the entire mass was removed by direct laryn-

gосcopy with punch forceps. The pathological report of the remains of this tumor was as follows:

Microscopic: Sections from the vocal cord show the same picture as that found in the previous section. The marked proliferation of the granular cells has caused a bulging of the overlying squamous epithelium and, at one point, an infiltrative down growth simulating a squamous cell epithelioma. A number of pearls have been formed, with central keratinization. Except for this, however, and the isolation of the epithelial nodules in the tissue beneath the surface, the cells all appear very well differentiated. Only one mitotic figure in the section is found.

Diagnosis: Granular cell rhabdomyoma of vocal cord.
Dr. A. P. Stout.

The observations on Aug. 20 and 27 revealed that the area was healing. On Oct. 16, on the arytenoid and left vocal cord there was a soft vascular almost pedunculated mass which extended out into the lumen of the larynx. This was removed with grasping forceps and the microscopical report given showed granular cell rhabdomyoma of the vocal cord.

The patient had periodic examinations and on Dec. 19 a little swelling with a white cap was noted just above the posterior end of the left vocal cord. This was removed with forceps. The pathological diagnosis of this was granuloma of the vocal cord.

Since then, the patient has been examined frequently and no recurrence has been noted. Her voice is normal.

CONCLUSIONS.

The sixth case of rhabdomyoma of the vocal cord is here recorded in the literature. It was treated by direct laryngoscopy and removal with forceps and no recurrence has taken place to date.

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103 East 78th Street.

COMPLETE REMOVAL OF TONSILS AND ADENOIDS UNDER GENERAL ANESTHESIA WITHOUT LOSS OF BLOOD.

DR. ROSARIA B. ROSSELL, Buffalo.

The evolution of the technique for the removal of tonsils and adenoids is a long chapter in the history of medicine, but, the last word, as yet, has not been written. In writing this observation I suggest only that a review of our present methods may not be amiss.

A complete radical removal of tonsils and adenoids is always possible when a free and profuse bleeding does not take place. Incomplete removal of tonsils and adenoids is most often due to bleeding during the early stage of the dissection which obscures the field of operation. A bloodless field of operation with good visibility is essential to all good surgery.

A blood-free field of operation can be maintained by using suction and swabbing, by grasping spurters and by careful dissection within the capsule. These methods do not, however, attain a truly bloodless field and besides prolong the time of operation.

Loss of blood from a tonsil and adenoid operation is not a matter to be entirely overlooked. Examination of the contents of the suction bottle will often show a surprising amount of blood. Such a loss is bound to be harmful to the economy of the system. This operation is also most often performed during the existence of a poor general condition together with the local pathology. Minimizing the loss of blood will aid towards faster recovery and better clinical results.

Preoperative preparation of the patient is of great value. A careful history to exclude hemophilia and individuals prone to excessive bleeding will prevent disastrous complications from loss of blood. Coagulation tests and giving ca-lactate are of some benefit. Blood transfusions before operation, in selected cases, may be indicated.

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Drugs which prevent hemorrhage act in three ways: 1. By causing a constriction of the blood vessels and preventing flow; 2. by coagulation; 3. by true clotting. Adrenalin is among the most active of vasoconstrictors. Injection of adrenalin solution into mucous membrane gives very prompt effect. Absorption is slight because of the primary constrictor action and ischemia, and its systemic effect is slight and very brief in the normal individual. Some dilatation follows the constrictor action, but coagulation is usually established and no alarming reactionary flow occurs.

By incorporating adrenalin in the injection solution for local anesthesia in the removal of tonsils, a bloodless field of operation is obtained. This method for inducing hemostasis is very widely used. Ill effects reported from its use have all the earmarks of concentration beyond the safe maximum. Accidents reported with local anesthesia have been mostly due to the toxicity of the cocain procain combination or substitution of one for the other.

The larger and more important arteries supplying the tonsils branching from the external carotids, enter at the hilum or the juncture of the lower and middle third of the tonsil, with the exception of the descending palatine which enters at the upper pole.

With this arterial distribution it is possible to obtain a bloodless field of operation by the use of adrenalin solution injected at two points when operating with general anesthesia as well as with local anesthesia.

A solution of six drops of adrenalin chloride to 4 cc. of double distilled sterile water is recommended. As soon as the general anesthesia is complete the adrenalin solution is injected at the following points: 1. At about one-fourth inch from the margin of the mucous membrane at the upper part of the superior lobe of the tonsil; 2. at about one-fourth inch from the margin of the mucous membrane at the junction of the middle and lower third of the tonsil. Two cc. are used to each tonsil. A long, gold needle curved at the tip on a 5 cc. metal plunger syringe is used. The fluid is directed into the loose tissue of the capsule by tactile sense, being careful not to perforate into the substance of the tonsil.

The tonsils are removed by complete semisharp dissection and snare at the lingual juncture; by keeping within the

capsule injury to the large vessels is avoided; oozing does not take place; a clean dissection without trauma to the muscles in the bed of the fossae and removal of the whole tonsil and nothing but the tonsil is facilitated; a clean fossa without scarring, retraction and growing together of pillars is attained. Primary hemorrhage or bleeding during the operation is thus under control. No time is lost during the operation with swabbing and suction to arrest bleeding. Landmarks are visible from beginning to end of operation. The large vessels at the hilum may be grasped before cutting and then tied with a catgut ligature, thus sealing a common source of postoperative hemorrhage.

Secondary hemorrhages, or those occurring five hours to five days after the operation, are no greater than those under general anesthesia without the adrenalin injection. Adrenalin action is no longer of consideration.

Postoperative complications due to inspiration of infected blood during the operation are thus prevented.

Removal of adenoid tissue should be done with as much thought and care as the removal of tonsils, instead of its being a secondary matter to tonsillectomy.

Adenoidectomy is usually accompanied with a considerable loss of blood and often results are poor, regrowth rapid and frequent, and injuries to the Eustachian tube not unusual.

Adrenalin solution and a soft palate retractor will facilitate epipharynx visualization rendering a blind space directly accessible to a clean removal of all adenoid tissue.

The adrenalin solution 1:1000 can be applied with a curved metal applicator swab through the mouth, or, if preferred, with a postnasal string pack placed before the beginning of the operation and left in during the dissection of the tonsils.

SUMMARY.

A complete removal of tonsils without loss of blood under general anesthesia is facilitated by the use of adrenalin solution injected into the loose tissue of the capsule of the tonsil after the completion of the anesthesia.

The hemostatic action of adrenalin is prompt; systemic action brief. No time is lost during operation in trying to stop bleeding. Preoperative measures are of value.

Postoperative results are better. Recovery from the operation faster. Postoperative complications from inspiration of infected blood less likely. Secondary hemorrhages are not affected because of the transient action of the adrenalin. Tying off the large vessels at the hilum is an important preventive measure.

The removal of the adenoids should be accompanied with as much care and consideration as the removal of the tonsils. Application of adrenalin solution and the use of a soft palate retractor will facilitate a clean, complete removal of all adenoid growth.

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- 313 Elmwood Avenue.

CASE OF TIC DOULOUREUX CURED BY TONSILLECTOMY.

DR. MAURICE KORNBERG, New York.

The causative factors of tic douloureux as well as all other neuralgias, in diverse regions of the body, are very numerous. Because of the extraordinarily wide range of causative factors, the treatment in each case is necessarily different, depending on the particular etiologic factor. This case is of interest because of the immediate cessation of symptoms of a right-sided tic douloureux of two years' duration following a tonsillectomy.

Report of Case: H. K., male, age 31 years, began to have attacks of severe pain on the right side of the face, involving the malar bone, front of the auditory canal and the border of the chin. These pains were paroxysmal in character and were always preceded by a burning sensation, and lasted from 15 to 20 minutes. At the beginning, these seizures occurred rather infrequently, but later they appeared as often as three times a day. Not unlike many other victims of tic douloureux, the patient had two teeth removed without any relief of symptoms.

Patient came to me, giving a history of frequent sore throat, and upon examination, I found that he had badly infected tonsils, the crypts of which contained pus and caseous material. I, therefore, advised removal of these tonsils. On May 2, 1934, I operated on the patient, and while dissecting the upper pole of the right tonsil, a few drops of pus oozed out from the supratonsillar fossa.

I wish to emphasize the fact that for three months preceding the tonsillectomy patient had daily attacks of pain, and since May 2, 1934, that is, the day of operation, his tic douloureux seizures ceased completely.

COMMENTS.

The strikingly sudden cessation of symptoms following the tonsillectomy is strongly conclusive that the etiologic factor

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of the tic douloureux, in this particular case, was the infected right tonsil. It is important to remember that the tonsils receive their nerve supply from the middle and posterior palatine branches of the sphenopalatine ganglion and the tonsillar branch of the glossopharyngeal nerve. These palatine nerves are sensory nerve fibres derived from the maxillary branch of

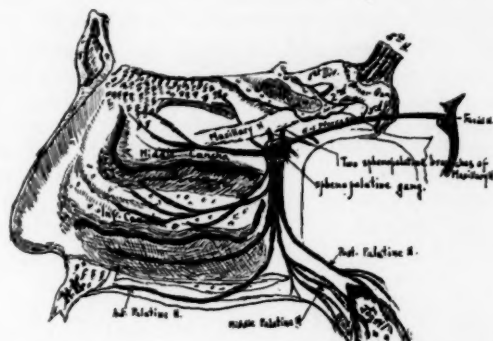


Fig. 1. Sphenopalatine ganglion with sphenopalatine branches of maxillary nerve, most of the fibres of which pass directly into the palatine nerves which supply the tonsils.

the trigeminal nerve which form the sensory root of the sphenopalatine ganglion, but most of the fibres pass directly into the palatine nerves supplying the tonsils. We can, therefore, readily see that an infection of these palatine nerves, which are derived from the trigeminal nerve, could cause, reflexly, a trigeminal neuralgia.

441 East 15th Street.

HISTORY OF THE AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY.

DR. MAX A. GOLDSTEIN, St. Louis.

To chronicle the history of the Academy may be an exalted task but there is scant opportunity for flights of oratory or flow of wit, yet history and historians are necessary adjuncts to organized society and civilization; so I will ask your indulgence for the necessary data injected into this chronicle.

When President Eagleton invited me to present a sketch of the history of this organization he honored me as a charter member and as an early President of the Academy and stimulated my memory of its inception nearly 40 years ago; he also honored my native State of Missouri, as this Society was born there in 1896.

While the Academy is celebrating its Silver Anniversary tonight we must not fail to respect its ancestry and glorify the genealogical tree from which it sprang. To Dr. Hal Foster, of Kansas City, belongs the credit for its birth. In the Fall of 1896, there was issued by Dr. Foster, as acting Secretary, an invitation to a selected group of eye, ear, nose and throat specialists of the West and the Southland, to meet in Kansas City to organize such an association, and this meeting was held on April 9-10, 1896, in Parlor "S" of the Midland Hotel. The meeting was called to order by Dr. J. H. Thompson, President of the Kansas City Academy of Medicine; the address of welcome was given by Dr. C. Lester Hall, President of the Missouri State Medical Association, and the response by Dr. R. S. Black, President of the Kansas State Medical Society. About 50 physicians were present and it is interesting to note that the following 27 States were represented: Alabama, Arizona, Arkansas, California, Colorado, Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, North Carolina, Ohio, Oregon, South Carolina, Tennessee, Texas, Virginia, West Virginia and Wisconsin.

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Dr. Adolph Alt, of St. Louis, was elected the first President and Dr. Hal Foster, Secretary. The Society was named the Western Ophthalmological, Otological, Laryngological and Rhinological Association. But little time was spent in discussing the constitution, by-laws and red tape, so usual at assemblies of this character. An elaborate prearranged scientific program occupied the time of a full two days' session. A printed copy of the original program is here offered as a souvenir of the occasion.

The members present signed the roster and this was recognized as the charter membership of the organization.

Time has rolled on and taken its toll, and of this original group of 50 only six members survive: Drs. Carl Barck, of St. Louis; Hamilton Stillson, of Seattle; Herbert Moulton, of Fort Smith, Ark.; Fayette C. Ewing, of Shreveport, La. (then of St. Louis); Hal Foster, of Kansas City, and Max A. Goldstein, of St. Louis.

The complexion of the membership then was distinctly western and southern in character and it maintained this geographic limitation for a number of years until its rapid growth and scientific activities attracted ophthalmologists and otolaryngologists of all sections of the country.

The senior national societies in these specialties: The American Ophthalmological, the American Otological, the American Laryngological and the American Rhinological and Otological Societies, had prescribed limitations in their membership to which younger men of the profession were rarely eligible.

The outstanding purpose of this Society then was to offer the younger men the opportunities of a scientific forum and fellowship, and this has continued as a valuable tradition of this organization.

Coincident with the celebration of the Silver Anniversary of the Academy today and the meeting held in Cincinnati in 1901 during my presidency, the idea of changing the name of the organization was first discussed, and in 1910 at the meeting in Cincinnati the name was changed from the Western Ophthalmological, Otological, Laryngological and Rhinological Association to the American Academy of Ophthalmology and Oto-Laryngology. The membership had increased to over 700,

the geographical distribution of the membership had extended to every State in the Union and these united forces clamored for and were justified in their plea for national recognition and a national name; and so this sturdy and lusty son of a pioneer Missouri sire was born.

As the scientific strength of the Academy grew and its membership increased by leaps and bounds another valuable feature was added as the demand by the younger element for post-graduate study became insistent. The promotor of this feature was Dr. Secord Large, of Cleveland. In 1921 at the meeting in Philadelphia the first study groups were announced as part of the annual program. These study groups, led by selected members who had specialized in the specialties, became so popular and were so well attended that they have been one of the outstanding activities of the organization and have been continued with ever-increasing interest and efficiency to the present day. An annual meeting of the Society today without these formidable study groups or instruction courses would lack one of its most valuable units—and well might this be so for, in the growth, evolution and independence of American ophthalmology and oto-laryngology and the conflicts of European strife and entanglements, the foreign meccas for further study in our specialties are no longer indispensable and the exodus of American specialists to Europe, less frequent.

Our own universities, in their medical departments, have rightfully assumed their responsibilities and interests in the teaching of the specialties and America today has its own meccas and centers of ophthalmology and oto-laryngology.

With the organization and practical operation of the American Board of Ophthalmology and the American Board of Oto-Laryngology the Academy has made its most valuable contribution not only to American Ophthalmology and Oto-Laryngology but also to American medicine.

This thought originated in the American Ophthalmological Society and was actively followed up by the Academy. To Drs. Beck, Carmody and Skillern must be given credit for its impetus in the Academy—all men of fine executive talent, foresight, scientific optimism and constructive purpose.

It was a glorious piece of work from its inception to the practical development of its present efficient form. What it has

done and will do to elevate the standards and maintain the scientific strength and professional dignity of American ophthalmology and oto-laryngology is an unwritten chapter in medical history.

To those who are more intimately informed concerning the work and purpose of the groups constituting these examining boards, their conscientious, loyal, impartial and efficient service; the widespread value of scientific standards created by these labors; the legitimate safeguarding of medical practice and of the best interests of patients, stand out as magnificent factors of human and humane accomplishment.

Step by step the work of these examining boards marches on to greater heights; foundation stones are being laid for the building of a finer and better American ophthalmology and oto-laryngology; other national organizations in the specialties have joined in the medical onward march, other specialties realizing the value and character of these efforts are adding their strength; hospitals, recognizing the influence and advantages of this protection to them and their patients, are limiting their staffs to qualified holders of certificates of these boards, and the outlook for a greater American medicine is becoming more hopeful.

Distinguished foreign specialists have been guests of the Academy every year and have contributed of their wisdom and experience to the scientific strength of our meetings.

The establishment of a research fund several years ago will assist those of our members whose talents incline toward original investigation to carry on. The printed *Transactions* of the scientific proceedings of the Academy each year have long since been recognized as a valuable contribution to the literature of our specialties.

At this interval I desire to offer a memorial tribute to three former Presidents of the Academy, all of Cincinnati, who have contributed much to the development of our specialties not only in their home city but to the nation at large. They are: Dr. Christian R. Holmes (President, 1902); Dr. Derrick Vail (President, 1908) and Dr. John W. Murphy (President, 1913).

It is not customary in a chronicle of this character to single out the services of any one member, but we should not over-

look this opportunity to refer to the invaluable services that have been rendered for over 10 years by our Executive Secretary, Dr. William P. Wherry. He has thoroughly justified the act creating the office of executive secretary, for he is a tower of strength in the discharge of his multiple duties in this office. It is due largely to his genius, alertness and executive ability that the Academy has prospered in its numerical and financial strength and enthusiastic cooperation to so high a degree.

In forecasting future activities of the Academy we must not fail to cite: 1. Its attitude to State Medicine and the conservation of the equity and dignity of medical practice; 2. Its influence in hospital control of qualified special practice; 3. regulation of clinical abuses; 4. cooperation with the Permanent Committee on the Deaf Child appointed by the American Medical Association about 10 years ago; 5. helpful service to Leagues for the Hard-of-Hearing throughout the country; 6. prosecution and elimination of quacks and quackeries; 7. participation in state and national legislation in the interests of American medicine.

If we may judge the future of the Academy by its accomplishments in the past it may be fair to predict that the continuance of its activities, its moral influence for better medical practice, its scientific democracy and the united strength of its present membership of 2400 Fellows will yield a golden harvest in the interests of mankind.

4574 West Papin Street.

THE NEW YORK ACADEMY OF MEDICINE.

SECTION OF OTO-LARYNGOLOGY.

Meeting of Feb. 20, 1935.

Cases Illustrating the Management of Anterior Surface Subcortical Fistulas in Petrous Pyramid Suppuration. Dr. Mervin C. Myerson.

This presentation centers about two cases which we operated upon last year. By now we are all impressed with the fact that infection of the petrous apex with a trapping of the exudate in the apex usually occurs in a pneumatized bone. Although we occasionally encounter the disease in diploic bones, the vast majority of the suppurations of the petrous pyramid are found in pneumatized bone. This was established by Kopetzky and I do not believe that it is a moot question any more. It is also becoming very obvious as time goes on that fistulas occur from the periphery; that is, from the mastoid area and the middle ear area, into the apex, in almost all, if not in every case of petrous pyramid suppuration. The fact that we cannot demonstrate the fistula in every case does not prove a fistula does not exist. If one reviews the literature one is impressed with the fact that fistulas have been found in one of several locations, and in a good many instances, perhaps in a majority of instances, enlarging the fistula and draining through the fistulous tract has been sufficient to procure a complete recovery. Everyone can readily understand that if a fistula is located very close to the anterior surface cortex, or the superior surface if you will, its very close proximity to the cortex may and very likely will involve the more firm and sclerotic bone. The first case taught us that such is not at all unlikely.

Here is a diagram to utilize in telling the story of the results of our review of the literature. My assistants, Dr. Rubin and Dr. Gilbert, and I have gone over the literature and have found that 53 fistulas have been reported as having been found either at autopsy or at operation. Of the 53 fistulas, 25, or almost 50 per cent, were found in relation to the anterior surface; that is, 14 were anterior to the superior canal, eight were posterior to the superior canal and three were more posterior, at the posterosuperior border. The others were distributed in other localities, which does not concern us this evening, but I call your attention to the fact that this position of anterior to the superior canal is the location of the largest single group of fistulas. You will readily understand that if a fistula is located very close to the cortex high up, the chances of that cortex becoming involved in the suppuration are much greater than if the fistula is lower down.

Although it is not usually appreciated, a good many anatomical specimens show cellular structure above the superior semicircular canal and where we have such cell spaces above the arch of the superior canal we can readily see why the cortex would have to become involved because of the very little space between the cortex and the hard bony arch.

There are two reasons why we feel that when a fistula is found in relation to the anterior surface cortex, simply finding the fistula, enlarging it and draining off the pus may not suffice. One is that in the structure of the petrous bone we find the apex dips down and acts as a reservoir, and the space between the superior canal and cortex may be likened to the neck of a bottle. There may be difficulty, therefore, in providing a sufficiently large drainage tract to drain this type of cavity.

This slide (No. 2) concerns a colored girl, age 22 years, who came to us last April and who after 21 days of an acute otitis media had a mastoidectomy done. Seventeen days after that she developed pain behind the eye and her temperature rose to 104.8°. She had a chill coincidentally with the rise of temperature. The pain behind the eye, the profuse postauricular discharge, the suggestive findings on the X-rays and the fact that she had had a mastoidectomy

to my, all grouped together led us to believe that she had disease in the petrous pyramid and involvement of the apex. The mastoid wound was reopened, the sinus was explored because we felt that we might be dealing with a sinus thrombosis, but the sinus walls were perfectly normal, apparently. However, in the region of the external canal and lateral to the plane of the superior canal we found a black necrotic spot and followed it anteriorly for about 2 cm. with a probe. The withdrawal of the probe was followed by a gush of greenish-yellow pus. At the time of this operation my attention was called to a small area of thickening in the postauricular region, which we did not pay particular attention to but which we remarked might be the beginning of an erysipelas, which was so. However, the subsequent course was very unusual and very interesting. Within 24 hours she developed a rigid neck, a positive Kernig, and spinal puncture revealed 325 cells per cmm. in the spinal fluid with 75 per cent polynuclears. Therefore, we felt that although we had found the fistula we had not accomplished what we had hoped we might have. So we explored again. It was our idea that along this fistulous tract there was very likely more diseased bone that was breaking through the cortex and causing meningeal irritation. We opened the dura over the temporosphenoidal lobe and converted what was originally a fistula into a large trough. The patient's convalescence was stormy because of her erysipelas but as far as her otologic picture was concerned, she did very well. The second petrous operation, done 24 hours after the first one, was done through the erysipelatos wound without any ill effect to the patient.

The second case relates to a white female child, age 7 years, who came under our observation after three days of severe acute otitis media. We kept her in the hospital for 12 days observing her carefully and then decided she did not have a surgical mastoid and referred her to the out-patient department for observation. On the thirty-seventh day she came back to us because she had pain in her forehead on the right side and a temperature of 103°. We continued our observation and on the forty-sixth day a right rectus paralysis appeared. The pain over and behind the right eye continued and occurred during the night particularly, keeping her awake. We therefore decided to investigate on the basis of her symptoms plus the suggestive Roentgen findings.

This child had a relatively mild acute otitis media for seven weeks. When we did the mastoidectomy we were astonished to find very little destruction of bone in the mastoid. However, as it is our policy to do as thorough a simple mastoidectomy as possible in these suspected petrous cases, removing the tegmen of the mastoid and of the antrum, when we cut down to a little above the level of the horizontal canal we found an area of softening into which our probe readily fell. Because of our previous experience and because the area of softening was high up in relation to the cortex, we decorticated the surface in that region down to the posterior boundary of the carotid canal superiorly.

Of interest in these two cases was the fact that as a result of our having made out of the fistula a trough which was wide and deep, the pain disappeared immediately, within 24 hours, and the clinical picture changed very rapidly. The ear was dry in two weeks and the temperature was normal in a few days. The mastoid wound was completely healed in three weeks.

It is our belief that when one finds a fistula in this region the period of convalescence is shortened if one makes certain, or as certain as one can, to remove any adjacent bone that might be diseased along with the fistulous tract.

We submit the proposition of the value of this type of procedure in fistulas that are in relation to the anterior surface of the petrous bone. We feel that in enlarging the fistulous tract and removing as much diseased bone adjacent to it as possible, particularly in removing the cortex which very frequently is grossly diseased, we will prevent a good many intracranial complications that might otherwise ensue.

DISCUSSION.

DR. RALPH ALMOUR: I feel personally indebted to Dr. Meyerson for reporting these two cases, for several reasons. In the first place, it shows that the lesion of petrositis can be diagnosed premortem, and secondly, it shows that

it is amenable to surgical cure; thirdly, because of the fact that I was privileged five years ago to present before this Section a surgical procedure which was designated solely for encapsulated empyemas of the petrous apex, this presentation by Dr. Meyerson has given us the opportunity to reiterate the fact that the procedure which we advocated was intended for encapsulated empyemas of the petrous apex alone. The indications for the surgery of petrositis were outlined by Dr. Kopetzky and myself, and Dr. Myerson's perfections in technique have simply added to what we felt were the indicated procedures at that time. We differ from Dr. Myerson but the differences are trivial and they do not warrant the attention of this Section. They mainly concern the nomenclature upon which I am sure we can agree. However, I do not believe that any procedure undertaken for the surgical treatment of a petrous lesion is an adequate one unless a radical mastoidectomy has been performed. We have had cures of these cases wherein fistulas were found that were exposed through simple mastoidectomies, but the results have not been satisfactory. These patients are living. Their hearing is not good. One is an epileptic and another has manic depressive insanity. To advocate not doing a radical because you might 'estroy the hearing has, to me at least, after observing these cases for two and a half years, not been borne out because these patients have not good hearing.

Our experience has been that most of the fistulas we have found have been in the area located at the tubal orifice, in the tympanic cavity, and even where we have found fistulae located in the post- or prelabrynthine areas, that is behind or anterior to the semicircular canals, we have in many instances found additional fistulae present either at the mouth of the Eustachian tube or behind or in front of the superior semicircular canal. In those cases of ours which did not do well following the evacuation of pus through the fistula found in the region exposed by a simple mastoidectomy, on the completion of a radical mastoidectomy we were able to discover a fistula at the mouth of the tube and by through drainage from one fistula to the other, a cure was obtained. The reasons we do not like the subdural approach as a routine measure, and we do not say it is not all right in some cases, will be covered by Kopetzky in his paper, and I hope the specimen which he brings here tonight will show the reasons. If you are going to inspect for a fistula which will lead into one of the areas of the perilabyrinthine spaces, you must inspect every portion of the perilabyrinthine spaces, and if you fail to find a fistula located in the area exposed by a simple mastoidectomy, it is then incumbent upon the operator to extend his surgical procedure to look in the areas of the prelabrynth, that is, anterior to the vertical canal, below the cochlea, in front of the cochlea and above in the supracochlear areas. The drainage of these will in most instances, and we feel certain from our experience should in every instance, suffice for a cure.

DR. MERVIN C. MYERSON: There is no rebuttal. I have the utmost respect and admiration for and I prize very highly the friendship that exists between Dr. Kopetzky, Dr. Almour and myself. However, to keep peace in the family I want to call Dr. Almour's attention to the fact that I was simply presenting two cases and not discussing operative procedures.

A Case Report of Generalized Meningitis of Otitic Origin with the Use of Forced Spinal Drainage as Part of the Treatment. Dr. William B. Allen.

(To be published in a subsequent issue of THE LARYNGOSCOPE.)

Otitic Meningitis—Pseudo Brain Abscess. Dr. Max Rabbiner.

(To be published in a subsequent issue of THE LARYNGOSCOPE.)

1.—Newer Concepts on Otogenic Meningitis. Dr. Samuel J. Kopetzky.

II.—Forced Drainage in Treatment of Otorhinogenic Infections of Central Nervous System. Dr. Lawrence S. Kubie and Dr. C. C. Hare.

(To be published in a subsequent issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. THOMAS J. HARRIS: I want first to depart a little from the usual procedure to say to you that I wish to congratulate you on behalf of the Section on the unusual excellence of the program you have arranged tonight. I think that in the contributions that have been made here, particularly on the subject of meningitis, this is one of the highest orders of programs we have had before the Section and particularly is this applied to Dr. Kopetzky's work which to me, and I think to most of us, is unusually rich and studious and full of thought on this subject in which we are all profoundly interested.

It may seem as if this were collusion, but it is not. I want to speak of what Dr. Kopetzky has referred to as a systematic attempt that is being made to study in this city otitic meningitis, and which was followed up by the remarks you have just heard from Dr. Dwyer. A number of us have felt that the time has come when we should not continue a hit or miss investigation of this subject. Such work as Dr. Kopetzky has given us tonight on the chemistry of the subject, or as I would call it the early diagnosis of meningitis, is so supremely important that we wish to have it carried out in every case that presents itself in Greater New York.

Take the question of recoveries to which he also has made reference. He has spoken of recoveries, but the literature on recoveries is after all very vague. Many of the cases that have been reported as recovered otitic meningitis we know have not even had bacteriological investigation of the cerebrospinal fluid, yet the cases have been reported as cured. What we would like to do in this citywide investigation is this, that every man who is practicing otology, everyone who is doing this work, shall co-operate by filling out in any case of meningitis the blank that has been prepared by the Committee, and then send it to the Committee here at the New York Academy of Medicine. It then will be analyzed by the Committee and we hope in time to get so many cases together that have been thoroughly studied and every possible check made, that we will be able to make some conclusions that will be worth while. We want you to carry this message and assist us in our attempt to put this through.

The points which Dr. Kopetzky has made of the importance in regard to operation are another thing that should be carefully studied; also in regard to what Dr. Kubie is going to tell us a little later on in reference to forced drainage. Instead of one or two men, or even three or four or a half dozen men undertaking this, we want the entire body of otologists in New York City engaged in this campaign. Then we plan speaking for the American Otological Society to introduce this work into other cities of the country. We hope in a few years to be able to get the facts in this very important subject, which we have failed to get so far in most cases, to effect a cure. As Dr. Kopetzky has pointed out, we hope to be able to do this when we take these cases early.

Forced Drainage in the Treatment of Otorhinogenic Infections of the Central Nervous System. Dr. Lawrence S. Kubie and Dr. C. C. Hare.

DISCUSSION.

DR. EDWIN G. ZABRISKIE: I have little to add, except to endorse as much as I can the procedure of forced drainage which has been introduced in our treatment of meningitis. I was particularly impressed with Dr. Kopetzky's plea for an early diagnosis and rapid installation of this treatment, because it is not at all difficult to understand that all the drainage in the world is not going to empty a purulent pocket, whether it be in the meninges or in the cortex, which has been walled off by plastic exudate. The earlier we can start our methods of drainage, the better chance we have of doing something for the patient.

There is one practical point that I think should not be overlooked, which is that every once in a while we run across an individual who cannot stand it. Dr. Hare and I recently had the experience in an individual in whom septic meningitis followed a fractured skull, who was more fortunate in the type of the infection than he was in his treatment. There was considerable doubt as to the diagnosis, and finally this was solved by the Board of Health technician who insisted it was a gamma type of pneumococcus, which is one of the less

virulent types. This boy has made a complete recovery, but at times we were forced to interrupt the drainage and substitute ordinary puncture because of the unfortunate physical effects, the exhaustion and temperature reaction which seemed to follow the drainage.

DR. SAMUEL J. KOPETZKY: Mr. Chairman and gentlemen: I regret that I had to hurry through the chemical findings. In reference to the discussion of the forced drainage method, you cannot always use 0.5 per cent fluid. As the case goes along, there is a change in the fragility point of the blood of the patient. Therefore, to the procedure as put out by Dr. Kubie we have added a fragility test each time before instituting the drainage, so as to be sure to get our fluid above the laking point of the blood. It very definitely varies. That is the only addition.

The other point I wish to make is to demonstrate these veins on the specimen. If I may I would like to use this demonstration to sound a warning which I have made before, that is, opening these veins to infection uselessly and needlessly. If there is a pathological process within the bone which has not yet shut off these veins by thrombosis, in separating the dura from its tegmen, these veins have torn. You cannot separate them without tearing them and you have millions of points wherein infection can travel. That is probably one of the reasons in earlier days we used to discuss the production of meningitis by the procedure of radical mastoidectomy. On the other hand, where nature shuts them off in the formation of an extradural abscess she shuts them off by a thrombus. The tissues break down and the separation takes place gradually. Those veins are going to be of more outstanding importance in our conception of how infection takes place as we get more familiar with them than in the past.

In the cases reported here tonight and my own cases, the necessity for removal of the tegmen with its thrombosed veins is a distinct step towards the stopping of the lesion. In the case of Goerke, where he reported pulling out a thrombus 6 cm. long, he had a complete recovery but he never knew why. He simply reported it as a finding without any explanation, but since then it has been put in its place as one of the pathological tracts causing the lesion.

Dr. Batson has taken up that end of this problem with me and is getting a series of these specimens ready for presentation at some future time, showing the development of these veins in the middle ear, the mastoid process and the petrosal process, from birth on through the different ages. This specimen is from a child.

DR. LAWRENCE S. KUBIE: I would like to conclude by mentioning two points about technique. In the first place, I want to indorse what Dr. Kopetzky has said about the necessity of making fragility tests before each injection. At first I thought that it was enough to do a fragility test before the first injection; but there can be no question that in a prolonged treatment it is safer to repeat this test each time the injection is to be given.

The next point may seem to be a small one, and has to do with the needle which is used. In several cases, however, it has made a good deal of difference in the freedom of flow of cerebrospinal fluid.

It often occurs that if a patient falls asleep during a treatment and breathes deeply, during a prolonged inspiration the intraspinal pressure will drop below atmospheric pressure, so that he will aspirate a bubble of air into the canal. If the point of the needle lies in that air bubble, drainage is materially impeded and the operator becomes uncertain as to whether his needle still is in place. Then he is often led to manipulate the needle and his uncertainty increases. Furthermore he is likely to injure a small vein and get bleeding. With so little fluid in the canal it becomes difficult to be certain if one's needle is in proper position. To obviate this difficulty as far as possible, we are now using a heavy lumbar puncture needle, 14 to 16 gauge, made for us by Becton, Dickinson, of non-corrosive chromium steel. Into the shaft of the needle, opposite the flange and about an eighth of an inch further up the shaft from the beginning of the flange, a little hole is bored. Thus if the point of the needle is in such an air bubble the hole on the side of the shaft allows the fluid to flow nonetheless. With this needle we have had less difficulty of the kind described.

NASHVILLE ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY.

Meeting of April 15, 1935.

An Interesting Sinus Case. Dr. M. M. Cullom.

Dr. Cullom reported O. H., white female, age 8 years, seen by his partner, the late Dr. George W. Hale, March 3, 1890, and at intervals since that time. At the age of 2 years she had an abscess in her right ear, which opened without incision. The suppurat.on finally cleared up, only to recur at intervals afterwards. It began to discharge freely about two years ago and has continued to discharge most of the time since. The discharge now is rather small in quantity, but very offensive. In 1891, the year following, the patient developed mastoiditis on the right side which was operated on by Dr. Hale.

On April 4, 1935, she consulted me on account of an acute attack of sinus trouble. The examination showed the scar of the mastoid done by Dr. Hale when she was 9 years old. Transillumination showed the right antrum cloudy. An X-ray was made by Dr. H. S. Shoulders. His report is as follows: X-ray examination paranasal sinuses. "The right frontal sinus is normal in size and definitely cloudy; the left frontal sinus is clear. Anterior ethmoids on the right side are cloudy; anterior ethmoids on left side clear. The right antrum is definitely cloudy. The left antrum is clear. Sphenoid area is clear and sella turcica is normal."

The patient is now 53 years old and has suffered with sinus trouble since childhood. Being the sister-in-law of an otolaryngologist, she was under his care until his death and was treated at frequent intervals for her sinus disease. The interesting point is that she carries out the observation that I have made for the last 15 years; namely, that purulent infection of the middle ear is nearly always the result of purulent sinusitis on the same side as the middle ear infection. Beginning with a suppurat.on of the right ear which finally eventuated in a mastoiditis 44 years ago, she still has a purulent sinusitis of her entire right side with the exception of her sphenoids.

The lesson I learned from this case is the intractable nature of sinus infection unless it is properly taken care of. I have had several cases whose history I could trace back to early childhood just as in this one. So many cases of acute sinus disease in early childhood eventuate in chronic sinus disease which persists throughout life unless properly treated. This exposes the patient to middle ear infection, bronchiectasis, pneumonia, chronic laryngitis, digestive disturbances and in all probability gall bladder disease, appendicitis, heart affection and nephritis as well as the constitutional effects of focal infection.

